SIGNAL

December 1960

PHILCO ANNOUNCES

NEW HIGH-SPEED
SWITCHING TRANSISTOR
IN TO-18 CASE...

MASS PRODUCED with ABSOLUTE UNIFORMITY to the TIGHTEST SPECS IN THE INDUSTRY

Actual Size

This new Philco Germanium MADT is specifically designed for high-speed switching applications and is the ideal NOR logic transistor. The MADT Precision-Etch* process makes it possible to manufacture the 2N779 with the tightest control of parameters of any transistor in the entire industry. This extreme uniformity greatly simplifies the design of high performance, low cost switching circuits. For complete data and information, write Dept. S1260

*Trademark Philco Corp.

MADT® 2N779

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	−65°C to +100°C
Collector Voltage, V_{CES}	−15 volts
Total Device Dissipation at 25°C	60 mw

ELECTRICAL CHARACTERISTICS (T=25°C)

	Min.	Typ.	Max.	
Static Characteristics				
Collector Cutoff Current, I_{CBO} (V_{CB} = −5v)		1.0	3	μa
DC Current Amplification Factor, h_{FE} (V_{CE} = −0.5v, I_C = −10 ma)	50	90	200	
Base Voltage, V_{BE} (I_C = −10 ma, I_B = −0.5 ma)	0.29	0.33	0.36	volt
Collector Saturation Voltage, V_{CE} (SAT) (I_C = −10 ma, I_B = −0.5 ma)	.09	0.12	0.16	volt
High Frequency Characteristics				
Output Capacitance, C_{ob} (V_{CB} = −3v, I_E = 0, f = 4 mc)		1.9	2.5	μμf
Input Capacitance, C_{ib} (V_{EB} = −1v, I_C = 0, f = 4 mc)		6.0	10	μμf
Gain Bandwidth Product, f_T (V_{CE} = −5v, I_E = 7 ma)	320	450		mc
Switching Characteristics				
Rise Time, t_r (β_C = 10)		13	18	mμsec
Hole Storage Factor, K'_s		39	50	mμsec
Fall Time, t_f (β_{CO} = 10)		10	18	mμsec

Immediately available from your Philco Industrial Semiconductor Distributor.

PHILCO®

Famous for Quality the World Over

LANSDALE DIVISION • LANSDALE, PENNSYLVANIA

TRANSISTOR CENTER U.S.A.

BMEWS . . . *eyes of the free world*

BMEWS . . . the Ballistic Missile Early Warning System is the free world's first warning of enemy ICBM attack.

Powerful radars with an accurate range of thousands of miles can detect incoming ICBMs minutes after launching. The transmitters for this defense system are being built by Continental Electronics . . . specialists in super power transmitting equipment.

Provided under sub-contract to General Electric and R.C.A., these transmitters from Continental Electronics are another contribution to our country's defense.

Continental Electronics Mfg. Co.

MANUFACTURING COMPANY

4212 South Buckner Blvd. • Dallas 27, Texas • EVergreen 1-1135 • SUBSIDIARY OF LING-TEMCO ELECTRONICS, INC.

DESIGNERS AND BUILDERS OF THE WORLD'S MOST POWERFUL RADIO TRANSMITTERS

ENGINEERS . . . FOR STIMULATING WORK ON THE ELECTRONIC FRONTIERS OF TOMORROW WITH A DYNAMIC, CREATIVE ORGANIZATION, ADDRESS RESUME TO CHIEF ENGINEER.

THIS IS AN IMPORTANT SERVICE FOR YOU

INTRODUCTORY CHRISTMAS OFFER

SPECIAL GIFT RATE FOR USE OF AFCEA MEMBERS ONLY
$4.00 PER GIFT SUBSCRIPTION
ADD $1 FOR EACH SUBSCRIPTION ADDRESSED OUTSIDE OF THE U.S.A.

YOU SAVE $1.00 UNDER REGULAR ANNUAL MEMBERSHIP RATE AND YOUR FRIEND WILL BE ENROLLED FOR FULL MEMBERSHIP

★ ★ ★ ★

Dear Member:
I am sure you will agree with me that we have much in common, especially when it comes to a selection of a Christmas gift for a friend. Because of our daily activities and other bona fide reasons, we invariably delay our shopping until a few days before Christmas. Then the question arises: Have we remembered everyone we should remember and/or have we selected an appropriate gift? As far as the immediate family is concerned this presents no problem. However, that important business contact, that friend in industry or military service, that outstanding employee in your plant and that "Ham" operator, engineer, student or that communications-electronics and photography enthusiast, to name a few, may very well have slipped your mind. Maybe you will remember everyone but the odds are that you may forget someone during those few hectic days before Christmas.

This year why not give SIGNAL magazine as a Christmas gift? In doing so you will perform a double service—a meaningful gift to a friend—a service to AFCEA by increasing the circulation of your Association's journal.

W. J. Baird, General Manager & Editor

★ ★ ★ ★

CHRISTMAS GIFT ORDER FORM

Please send SIGNAL for 1 year as my gift

1. To _____
(please print)
Street & Number _____
City _____ Zone _____ State _____
Sign Gift Card "From _____
☐ My card enclosed.

2. To _____
(please print)
Street & Number _____
City _____ Zone _____ State _____
Sign Gift Card "From _____
☐ My card enclosed.

3. To _____
(please print)
Street & Number _____
City _____ Zone _____ State _____
Sign Gift Card "From _____
☐ My card enclosed.

THIS GIFT IS TO BE MADE TO A NON-MEMBER. BECAUSE OF THE SPECIAL PRICE OFFER, THE $1.00 CHAPTER REBATE WILL NOT APPLY FOR THE CURRENT YEAR ONLY.

SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XV **DECEMBER 1960** **NUMBER 4**

CONTENTS

Why Not Join AFCEA? See Application Page 68

DEPARTMENTS

1624 Eye Street, NW
Washington 6, D. C.
Phone: EXecutive 3-3033

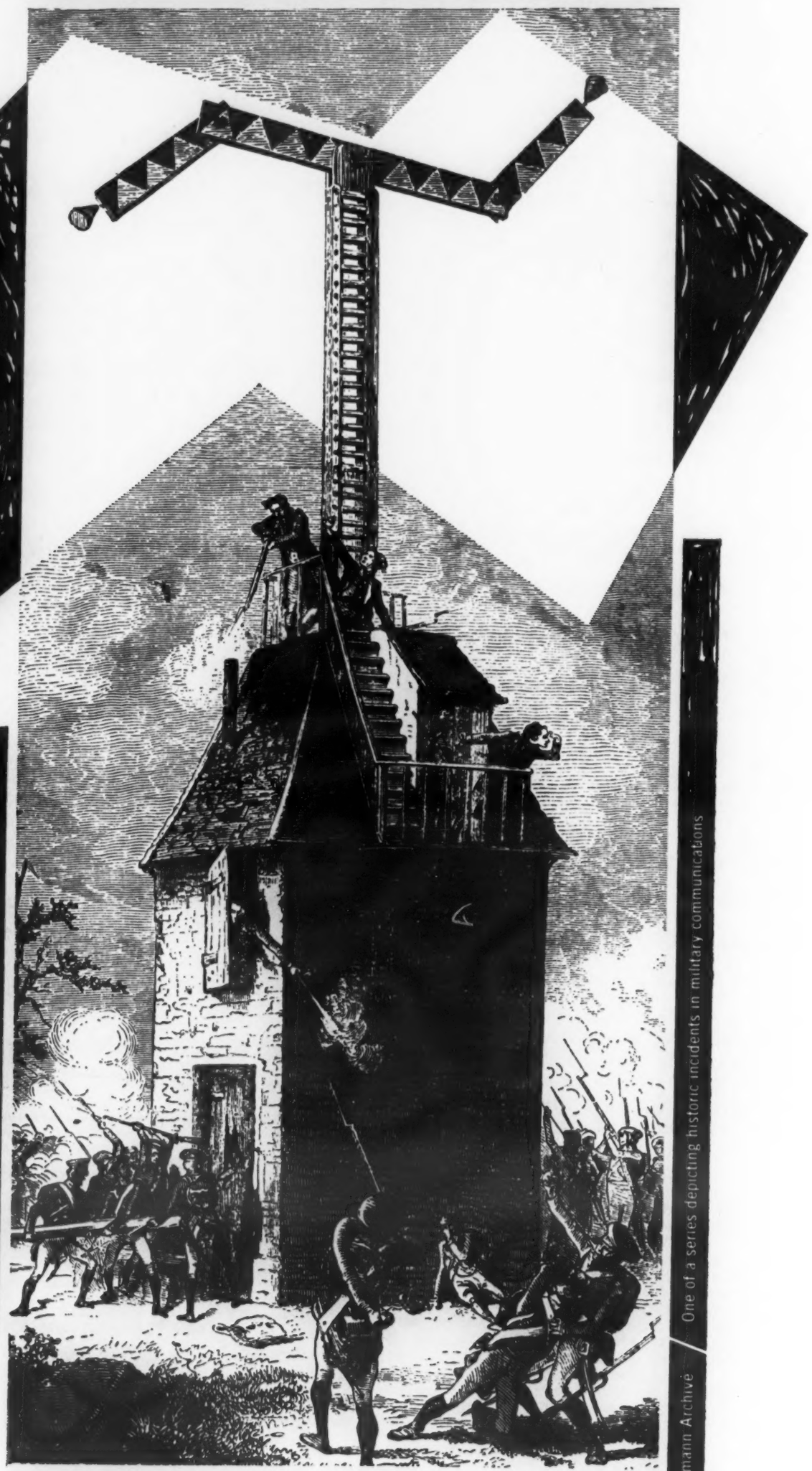
SIGNAL is published monthly by the Armed Forces Communications and Electronics Association at 1624 Eye St., N. W., Washington 6, D. C. Second class postage paid at Washington, D. C., and at additional mailing offices.

Subscription rate to members of the AFCEA: 1 year (12 issues), $5.00. To non-members, $7.00. To foreign post offices, $8.00. Single copies, $1.00 each.

Printed in U.S.A. by Monumental Printing Co. at Baltimore, Md. The publisher assumes no responsibility for return of unsolicited manuscripts or art. When sending change of address, please list the old and the new address, and allow 3 weeks for delivery of first copy.

BPA

LONG RANGE INPUT/1794/News of the recapture of Condé from the Austrians was sped to the French Revolutionary Convention at Paris in a matter of minutes via Claude Chappe's amazing télégraphe aérienne, or relay aerial telegraph, Sept. 1, 1794. A new era in rapid communications had begun. / Today, instantaneous and completely reliable Electronic Communications insure the immediate and continuous interchange of intelligence throughout the Free World. ECI is proud of its initiative and responsibilities in the design, development and manufacture of high precision electronic equipment to the critical specifications required in various aerospace and surface roles vital to our National Defense and to scientific achievement. An example is ALRI—Airborne Long Range Input—a program where ECI communications and data link equipment fill an integral and essential requirement in linking USAF's advanced early warning system to SAGE—our continental defense network.



One of a series depicting historic incidents in military communications

The Bettmann Archive

System Development
Communications
Data Link
Countermeasures
Computers
Actuators

ELECTRONIC COMMUNICATIONS, INC.
ST. PETERSBURG, FLORIDA

RESEARCH DIVISION
Timonium (Baltimore), Maryland

ADVANCED TECHNOLOGY CORPORATION (ADTEC)
Santa Barbara, California

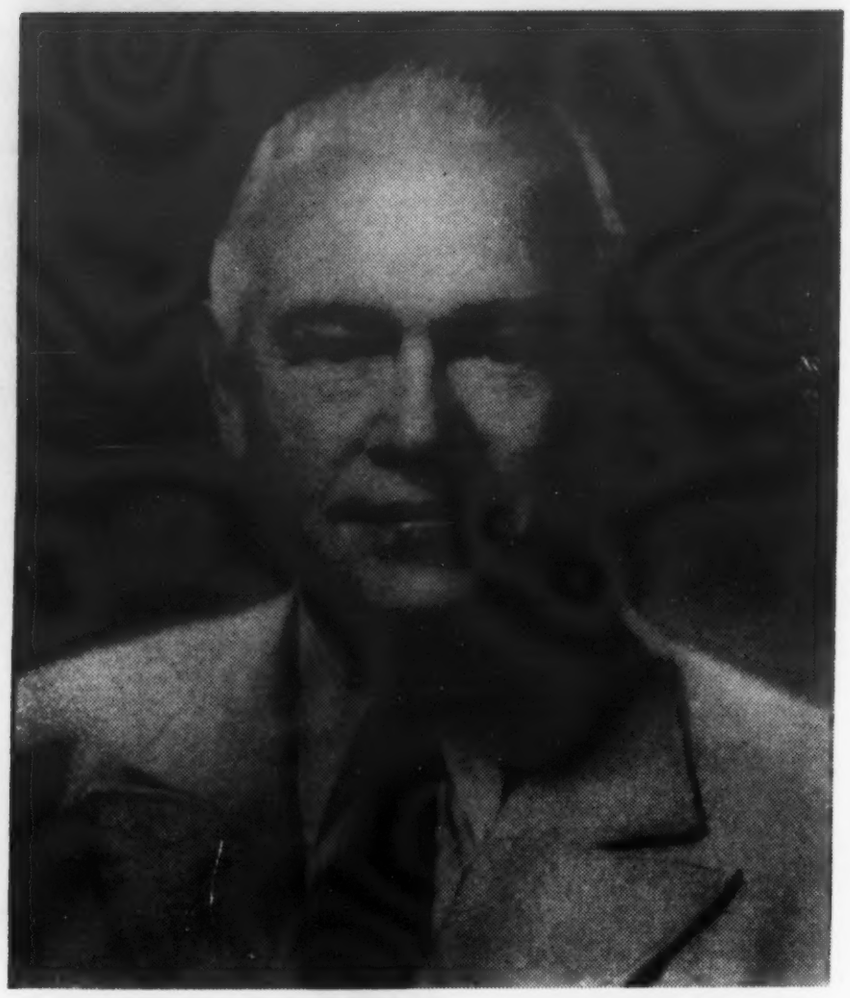
REGIONAL OFFICES: Washington, D.C., Teterboro, N.J., Boston, Mass., Dayton, O., Dallas, Tex., No. Hollywood, Calif.

B. H. OLIVER, JR.
National President, AFCEA
Vice President Upstate
New York Telephone Company

Greetings From The President

AT THE FESTIVE SEASON of our year it is so pleasant to be able to extend greetings to our members, to those who do so much for the Association in our Chapters, to our Directors and Officers, and to those companies who give us strength and support in what we do. Warm thoughts flow readily because we realize how the sum total of these efforts contributes something real and significant to the vitality of our great Country.

Merry Christmas and Best Wishes for the coming year that ushers in the second twelve months of a new young decade of hope and expectation! These thoughts, we in the Headquarters group, send to all of you, from all of us.



W. J. BAIRD
General Manager and Editor

The Relationship of J-6 and DCA

Many inquiries have been received by SIGNAL Magazine since the formation of the Defense Communications Agency (DCA),* as to the impact its functioning might have on the operations of the Directorate of Communications-Electronics, J-6, of the Joint Staff.

There has been much speculation which has varied all the way from a prediction that there will no longer be any requirement for a communications-electronics staff directorate at the Joint Staff level, to an estimated increased level of activity by virtue of the establishment of DCA. As is almost invariably the case in speculative discussion, the exact status is not fully known. It is too early to tell but the answer probably lies somewhere between the two extreme positions.

In an effort to clarify the situation, your editor will attempt to present relevant data which, while not resolving the matter, may permit our readers to become more informed than previously possible.

The J-6 at the Joint Staff level is the only Defense Department organization which combines, under one head, the responsibilities of the DOD for both communications-electronics and electronics not specifically communications, covering the Departments of Army, Navy and Air Force.

The Navy, the Air Force and the Marine Corps, at staff level, have dispersed the functional responsibilities for communications-electronics matters throughout their various agencies. The Signal Corps, with a staff element at Headquarters level, approaches the "One Head" concept for the Army. In response to decentralizing of functional responsibilities, it falls short in some details, particularly in the research and development aspects of communications-electronics.

The J-6 by virtue of his position on the Joint Staff has responsibility for coordination of matters with our allies, with treaty organizations (NATO, SEATO and CENTO) and with non-defense agencies of our government. This responsibility in general is discharged by staff representation on the many panels, groups and boards involved. Frequently the staff makes direct contact with these agencies to determine how and to what extent U.S. interests are involved. Such responsibility is definitely a continuing function at the Joint Staff level.

Some of the important elements of the functional charter of the J-6, as a member of the Joint Staff, can best be illustrated by recent actions which have occurred and their effect under a realignment of the Defense communications-electronics functions.

As concerns the highly important and increasingly critical field of allocation and conservation of our frequency resources, the J-6 charter states: "The Director for Communications-Electronics will . . . plan and coordinate policy development for frequency spectrum utilization and . . . monitor the joint aspects of military frequencies allocation and the management thereof."

A rather cursory consideration of these statements will lead to a quick conclusion that much more than the "Classical Communications" portion of the frequency spectrum is included in the above area.

Specifically, much work was done by Joint Staff and Service frequency planners in the preparation of a military position on the allocation of frequencies for radio astronomy and space. Much also has been, and is still being, done in coordinating with

*See November issue of SIGNAL for complete report on the Defense Communications Agency by RAdm. W. D. Irvin (Chief, DCA).

the FAA and other governmental agencies in the study of proposals for allocation of the VHF and UHF bands of frequencies. The requirements in these areas are critical, the competition intense, and any cost, resulting from a poorly considered decision, would be tremendous in terms of new or redesigned equipments. An entirely new approach to the problem of frequency compatibility—to be applied across the entire spectrum—is currently under development by military frequency planners. Thus, it is relatively easy to deduce that the specific interests of the DCA in the frequency spectrum represent only a portion of its total, both in extent and in effort to be expended by its Joint Staff managers in J-6.

In the functional area of air defense ground environment, of aids to air navigation both long and short range, of air-ground-air links both voice and data—in those areas commonly classed as "electronics"—the responsibilities of J-6 are in no way affected by the establishment of another agency. The many specific problems in these fields, including standardization, compatibility both within the military and between the civil and military, of digitalized message composition and format, rate very high in the functioning of J-6, presently and into the future.

Electronic warfare is a vital area where staff responsibility is assigned by charter to the J-6—specifically so with respect to the measures, counter-measures and counter-countermeasures which one side or the other takes to gain or pursue an advantage in the struggle for electronic survival. The broadness of its characteristics and the still-developing nature of its problems places a continuing requirement on the J-6 Directorate. The related problem of communications security and its opposite number, communications intelligence, are other vital functions whose staff aspects must be attended to by the Director of Communications-Electronics on the Joint Staff.

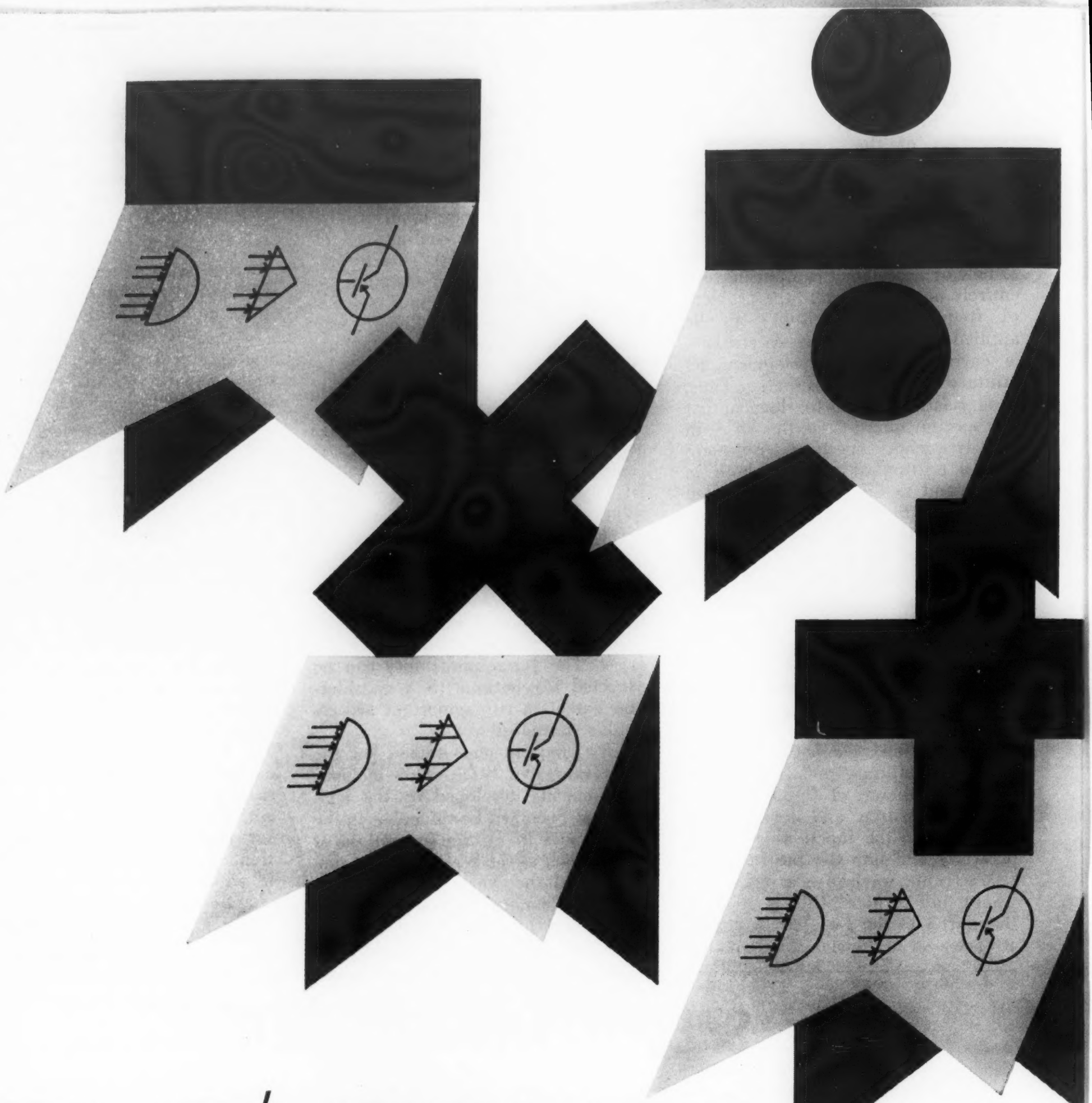
Within that area of long haul telecommunications where the newly assigned responsibilities of the Chief, DCA, are formidable and of no easy solution, some serious thinking can develop the following tentative relationship. Rather than a *transfer* of functional responsibilities from the J-6 to the Chief, DCA, in this field, that of a staff agency to an operating command should logically arise. The J-6 responsibility can be expected to continue to a considerable extent in two important aspects of this shared area.

First, requirements review for the Joint Chiefs of Staff. This includes requirements developed by the Unified and Specified Commands—in the Pacific and in Europe as well as of others such as the Strategic Air Command and the North American Air Defense Command. It also includes those from the Services and from the Chief, DCA, himself. It would seem that the evaluation and validation of requirements against the backdrop of Defense Department Strategic policies and plans, must continue to rest with the staff agency of the Joint Chiefs of Staff—J-6—who views them in jointly-derived total perspective.

Secondly, in the allied area of strategic communications planning; i.e., the translation of over-all military strategy into general communications plans capable of programming and implementation by DCA—in this area J-6 plays a major role.

The J-6 job can be said to be simplified to the extent that the DCA presents an integrated approach to the problem of providing and operating a communications system for the Department of Defense, the Joint Chiefs of Staff and their field commanders. In the many other facets of J-6 current responsibilities, no change is apparent.

Briefly, in summary we might say that the J-6, as a Joint Staff Director, owns two separate hats, one Communications and one Electronics. As a result of the formation of the DCA, J-6 wears his Communications hat cocked in a slightly different way than formerly, but wear it he does with responsibility and authority. As for his Electronics hat, the formation of the DCA and its assumption of assigned responsibilities does not change the angle, the responsibility or the authority of this chapeau.



COMPUTENCE

total competence in computation and data processing—the breadth, the brains and the background

The term: created by necessity to distinguish the new concept in computation—the computation of Burroughs Corporation. **Domain:** weapons systems, support systems for space, air, land and sea. **Qualifications:** 75 years devoted to computation and data processing; membership on Polaris and Atlas teams; system management of the ALRI team; facilities that range from basic research through production to field service. **Credentials:** high-speed computation for Polaris, miniaturized airborne data processors for ALRI, the Atlas computers that guided Explorer I, Transit and Midas satellites into orbit. **Destination:** the unknown, where total competence in computation and data processing crystallizes into Comp**u**tence to point the way.

Burroughs Corporation Burroughs *"NEW DIMENSIONS / in computation for military systems"*

"The basic premise of a truly democratic society is that a fine balance be maintained at all times between the rights of the individual and the rights of society."

DURING OUR LIFETIME, we have seen the miracles of scientific crime detection and fingerprint identification assist the law enforcement officer in the performance of his duties. Despite the increasing demands and the many additional responsibilities confronting our profession, police agencies across the United States cleared 58 per cent more crimes by arrest last year than in 1950.

Today, as never before, the falsely accused and the innocent victim of circumstances are assured that every facility at our disposal will be used to erase the suspicion cast against their names. At the same time, the underworld and its hangers-on can be equally certain that America's compact network of municipal, county, state and Federal law enforcement agencies will combine all available resources to guarantee that justice is done.

Cooperation is the keynote of the progress which has been made during our lifetime. Never has our profession been more strongly united in the fight against crime than it is today. Nor have the equipment and techniques for promoting the cause of justice ever been more efficient than those now at our disposal. Yet, America's crime problem continues to grow. The vast majority of law enforcement agencies still find themselves asked to do far too much with far too little.

It is tragic that during an era when the ultimate in police protection lies within the grasp of every community, our profession still is denied the wherewithal to fulfill its responsibilities. Inadequate budgets have become a perennial problem with far too many law enforcement agencies. Wherever the "penny wise and pound foolish" theory of false economy is applied to their reasonable requests for funds, they find themselves unable to perform their duties in the manner in which modern-day law enforcement is capable.

This is not just a problem of big cities or of small towns. It exists in communities of all sizes—and in every part of the nation. One large Southern community pays its patrolmen a starting salary of $279 a month, and the minimum workweek is 48 hours. In this same city, 18-year-old stenographers can find Government positions offering $337 a month starting salary for a 40-hour week!

In a medium-sized Western city, the situation is even more ludicrous. Here the starting salary of patrolmen is $175 per month. The Police Chief of this "enlightened" community earns $400 a month and, again, a minimum 48-hour workweek is required.

When conditions such as these persist, it is no wonder that many police departments have trouble recruiting qualified personnel and retaining competent officers. Many of your most trusted men have found that to provide their families the bare necessities of life they must supplement their meager police salaries by holding outside employment, which is certainly undesirable.

Add to these conditions the hazards to life and personal safety which confront the officer, the outmoded equipment he often is required to use, and the essential training which may be denied him because funds are not available. The obstacles in some localities are almost insurmountable.

The standards of the criminal mind are opposed to those of decent people. It has no morals, no conscience, no pity. This is the element which the law enforcement officers are forever fighting—and in this fight are forever being criticized by sob sisters, bleeding hearts and lawyers-criminal for using methods allegedly too harsh.

The American people are paying a terrific price for crime; and to learn that crime is still increasing at a rapid rate gives cause for sober thinking. America enjoys the world's highest standard of living but, at the same time, suffers one of the world's highest crime rates.

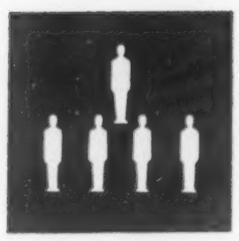
Since 1950, crime has increased 69 per cent—four times as fast as our expanding population. Today, we find ourselves confronted with the worst era of lawlessness in the nation's history. Each 20 seconds another serious crime is added to the nation's total. A murder, forcible rape or assault to kill is committed every four minutes. There is a burglary every 46 seconds; a robbery, every seven minutes; and 33 automobiles are stolen every hour.

While budget-cutting local politicians deny many law enforcement

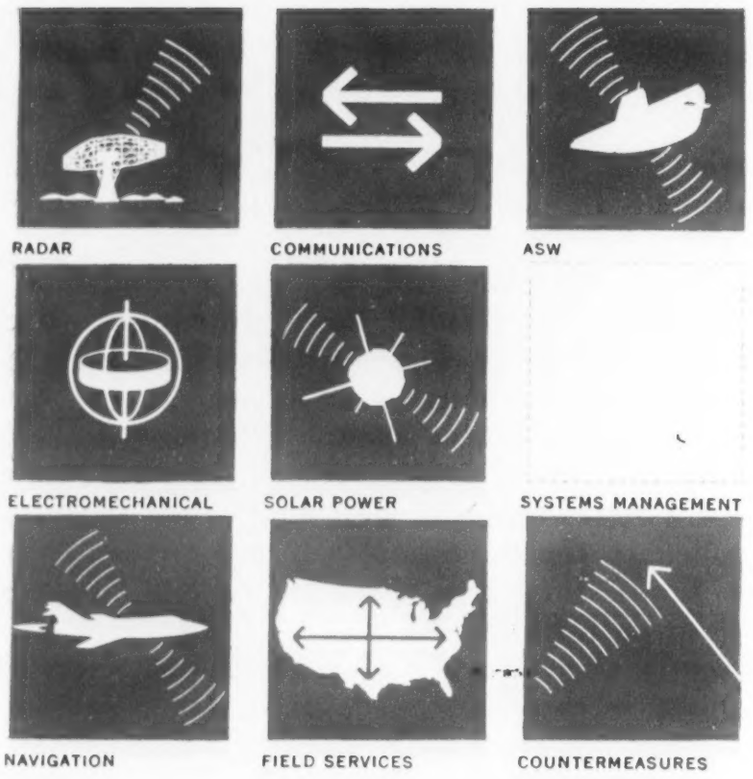
(*Continued on page* 11)

Hoffman

systems management problems?



As today's weapons and support systems become more and more complex, the need for teamwork and cooperation among contractors assumes increasing importance. Hoffman, a pioneer in the development of the TEAM concept, has acquired a unique capability in systems management. Hoffman's ability to draw together the specialized talents of several organizations is demonstrated by the success of the eight-company "Tall Tom" Team for the U.S. Air Force—an example of how Hoffman can help solve your systems management problems.



Hoffman / ELECTRONICS CORPORATION

Military Products Division

3740 S. Grand Avenue, Los Angeles 7, California

Significant developments at Hoffman have created positions for scientists and engineers of high calibre. Please address inquiries to Vice President, Engineering.

agencies the resources to adequately perform their duties, the American people are being fleeced by the criminal element as never before. Our nation's annual crime bill now totals $22 billion—an amount equivalent to $128 for every man, woman, and child in the United States. For every $1.00 spent on education, $1.11 goes to crime. And for every $1.00 contributed to religious organizations, crime costs our people $9.00.

Shocking though these statistics may be, a far more tragic aspect of America's crime problem lies in the role played by youth. The spectre of juvenile terrorism and gang-style intimidation hangs menacingly over community after community. A surging teen-age underworld—one which practices open defiance of the law and utter contempt for the rights and welfare of others—has arisen to challenge the forces of law and order. It casts a stigma upon every community where it exists.

Since 1948, juvenile arrests have more than doubled, while the population in this age group has increased by less than one half. Today, youthful offenders account for more than one fourth of the arrests for robberies, one half of the burglary and larceny arrests, and nearly two thirds of the arrests for automobile thefts.

But statistics are cold and lifeless. They do not tell the complete story of wanton brutality and mounting savagery which typify the arrogant teen-age gangs of today. In the explosive atmosphere surrounding the hangouts of these young sadists, no one may feel secure. "I'll get even with you one of these days even if I have to kill you" is the violent threat shouted at a judge in the Midwest by a 17-year-old terrorist who was sentenced to the reformatory for criminally assaulting a defenseless girl. "Born to hate cops!" —the words on a tatoo proudly worn by a young convict now serving a life term for the brutal murder of a fellow inmate.

These are not isolated cases. Disrespect for the law and for all forms of authority has become a badge of distinction in the eyes of growing numbers of teenagers. "You're wasting your time to arrest me," one 17-year-old burglar shouted at a pair of West Coast officers. This young man spoke from experience. He had been charged with crimes on three previous occasions without being committed for a single one of them.

This attitude of "I can get away with anything! I'm a juvenile!" has been fostered by a system of leniency which prevails among authorities dealing with juvenile offenders in far too many legal jurisdictions. No clear-thinking person would advocate dealing with all youthful offenders under the same laws which are applied to adult criminals. But, it is time that the interest of society be given at least equal consideration to that which is given to the small percentage of teenagers who violate the law.

We should be more interested in protecting society from criminals of any age than in protecting the young offender from society. Young hoodlums must learn that society will hold them responsible for their vicious acts of lawlessness.

I have always been skeptical of any system where the records of juveniles are jealously guarded from inspection and review by law enforcement officers. I feel that it is a violation of the best interests of the entire community to withhold from public notice the identities of teenagers who commit vicious crimes or those who are guilty of repeated serious violations.

Under the cloak of extreme secrecy which is attached to juvenile proceedings in many jurisdictions, shocking abuses of the public interest often can be found. Certainly, the officers who are charged with protecting the lives, welfare and property of all citizens throughout the community should have the right to inspect all records pertaining to local violations. And when juvenile authorities mishandle cases to the point where the safety of decent citizens is jeopardized, it is not only our right but our absolute duty to make certain that the facts are brought to the public's attention. To the vicious elements within our nation, existing immunity has frequently become license. At the expense of the many, protection and consideration have too often been given the few.

At times, the advocates who have asserted themselves as "experts" in the treatment of juvenile offenders have strained our conscience as public servants to the breaking point through their incredible tenderness and blind leniency.

It is discouraging to note the number and type of people who are naively engaged in promoting juvenile crime through well-meant protection of delinquents against accountability for their vicious acts. But this is only one of the obstacles confronting us today. There are many others—equally as serious and equally as fatal to the cause of decency.

Take, for example, the vast area of legal technicalities and delays—weapons which have been used time and again by the criminal underworld and its subversive counterparts through their legal mouthpieces to thwart the interests of justice. On repeated occasions, we have found that the legal definition of what constitutes proper police action is so lacking in clarity that even the courts are unable to agree.

What better example can be cited than the critical area of search and seizure? In the past 19 years, the Supreme Court has decided 30 different cases originating in police action and involving a question of search and seizure. In not a single one of these 30 cases could the Supreme Court reach unanimous agreement. And only two of the 30 cases were decided by a majority of eight Justices. With such a division of opinion on the Supreme Court itself, it is no wonder that so much confusion and uncertainty exist within the law enforcement profession—or that so many self-appointed underworld mouthpieces look upon the Fourth Amendment as one of their best means for circumventing justice.

The emphasis upon loopholes and technicalities in the law has become so extreme that last year one of our Supreme Court Justices found cause to warn his colleagues, "We should not place additional burdens on law enforcement agencies." Referring to the Court's decision in this same case, a major newspaper in the nation's Capital was prompted to remark. "When reasonable men and learned judges, examining the same set of facts, disagree as to where the line should be drawn between legal and illegal arrest, that line becomes so thin that one must wonder whether the intent of the Fourth Amendment has been more obscured than clarified."

The basic premise of a truly democratic society is that a fine balance be maintained at all times between the rights of the individual and the rights of society. Whenever one is accorded greater consideration than the other, justice becomes a mockery and our democratic traditions invariably suffer.

The machinery of criminal justice in this country exists for one purpose —to protect society. When it closes its eyes to the protection of society and sees only the convenience of the individual, then justice becomes a hollow mockery.

One distinguished jurist of our day exhibited a very realistic understanding of this concept when he

(*Continued on page* 44)

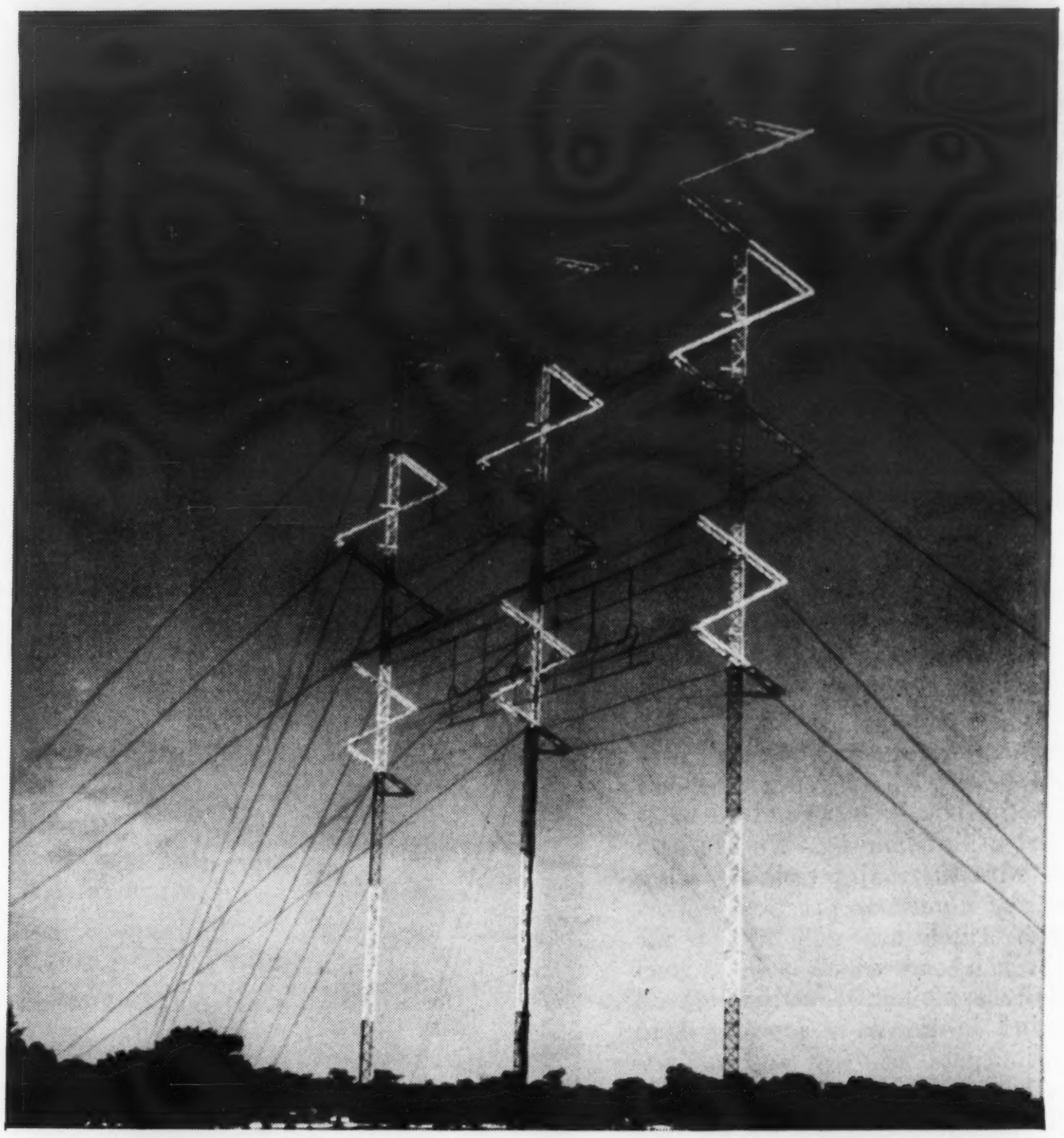
Engineer inspects Styroflex® cable installed on an antenna array at one of Pacific Scatter Communication System stations shown at right.

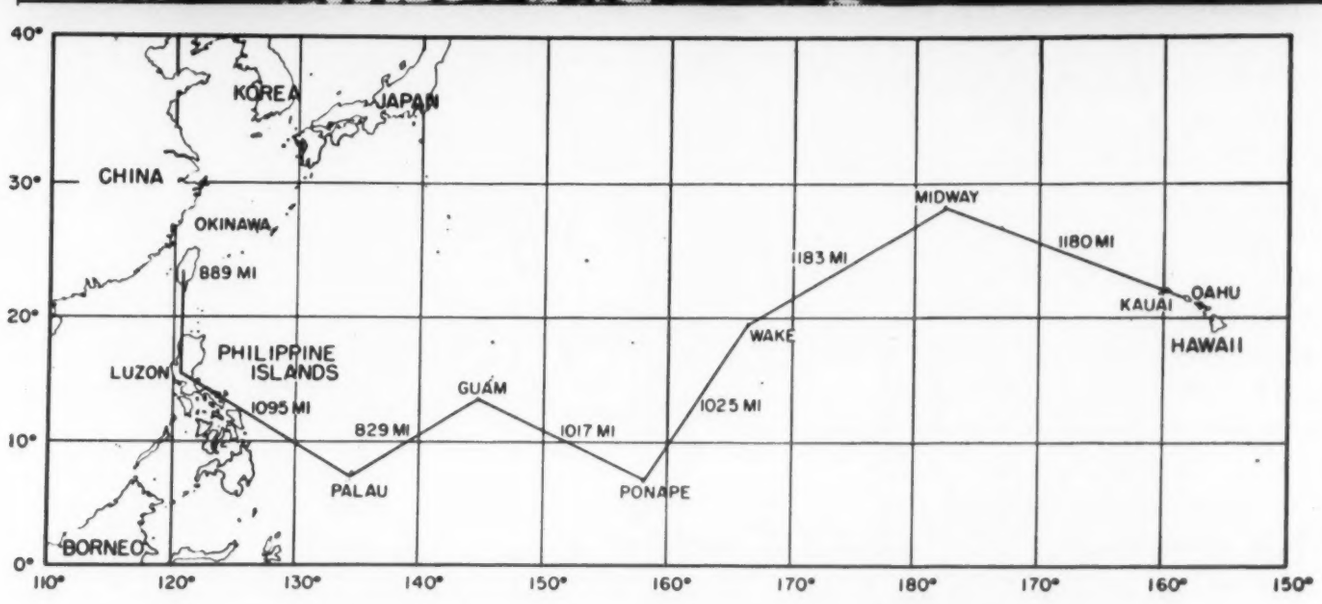
Over 40 miles of *Styroflex® Coaxial Cable* help assure

More than 200,000 feet of Styroflex® coaxial cables are in active use as balanced antenna feed lines in the recently completed Pacific Scatter Communication System stretching from the Hawaiian Islands to Okinawa. This trans-Pacific system, one of the largest and most advanced of its kind in the world, uses ionospheric and tropospheric propagation techniques that produce over 99% reliability. An important part of the Strategic Army Communications Network (STARCOM), the system was designed, developed and constructed by Page Communications Engineers, Inc. for the U. S. Army Signal Corps.

Each of the nine stations in the network is equipped with the same major component parts—transmitters, exciters, multiplex terminals and antennas. The cables used in the 200- and 400-foot antenna arrays range from 7/8" jacketed Styroflex® cable to 3 1/8" jacketed Styroflex® cable. About 7,000 feet of 1/2" jacketed Foamflex® cable is also used in the system. The Styroflex® cables were spliced in the field by an inert-gas Heliarc welding process to assure noise-free connections required for successful duplexed antenna operation.

The extremely low inherent noise level and low attenuation of Styroflex®—together with this air-





Pacific Scatter Communication System reliability!

dielectric cable's stable electrical and mechanical properties—especially qualify it for the critical specifications of this STARCOM system. If your system requirements call for a cable with low loss and high reliability, investigate the successful record of Styroflex®!

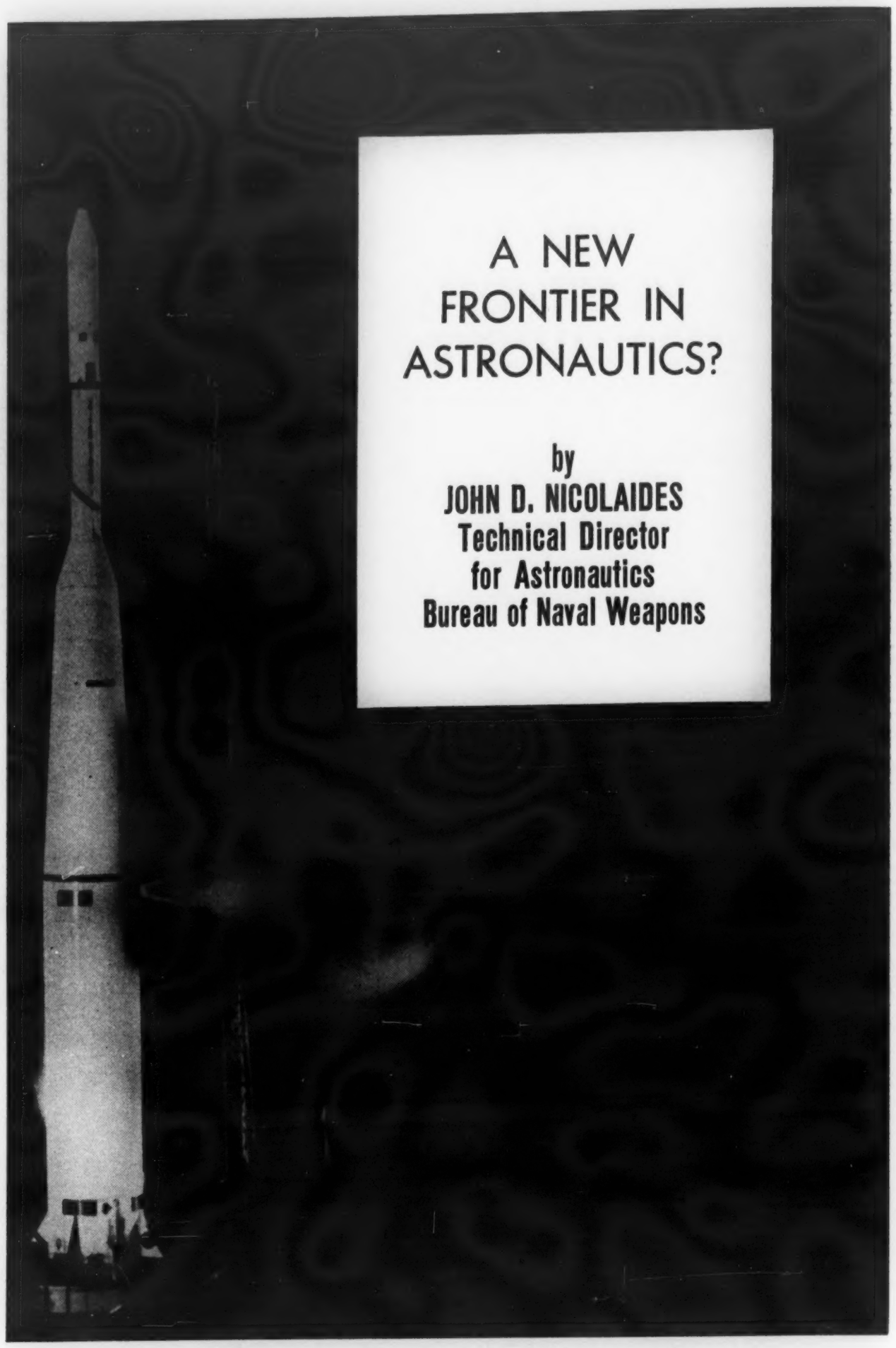
(Photos courtesy of Page Communications Engineers, Inc.)

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N.Y.

PD

A NEW FRONTIER IN ASTRONAUTICS?

by
JOHN D. NICOLAIDES
Technical Director
for Astronautics
Bureau of Naval Weapons



Delta launch vehicle which boosted Echo I into orbit

A GIANT STEP JUST HAS BEEN taken in astronautics. It was so silent and so smooth that it hardly was noticed. There were no headlines, no fanfare, no dramatic statements and none of the falderal which usually accompanies accomplishments in space. This giant step, perhaps one of the most important steps in the conquest of space, is the result of a number of separate, unrelated and unexpected lesser space accomplishments of late. It is the grand sum of these lesser space accomplishments which constitute the truly new situation which now exists. It is this new situation which requires new studies, new analyses, new efforts and new programs. As a result of this new situation all space programs may well require agonizing reappraisal and major reorientation. Just what is this unnoticed giant step? It is simply that space is becoming "a reality."

Our exploratory and research programs have yielded results beyond expectation and well beyond the original scientific planning. We are now faced with the major task of facing up to the numerous practical opportunities which are well within our easy reach and which will, if successfully exploited, directly serve all mankind in his daily pursuits here on earth.

In order to perceive this truly new and dynamic situation, let us now take another look at the record to date. One of the most significant accomplishments, not yet by any means fully appreciated, is the excellent performance of the Tiros I weather satellite. The information uncovered by this satellite is not yet fully analyzed or understood. It may take many months and even years before the full impact and importance of this space craft will be appreciated fully. However, it is now clear that many of the basic concepts of contemporary meteorology will have to be modified in a major way. It is also clear that the weather satellite provides a unique and awe-inspiring tool for undertaking both world-wide weather analysis and weather predictions in specific areas of immediate concern. Major atmospheric disturbances such as hurricanes and cyclones will be accurately tracked and their courses predicted using satellite technologies. New methods for predicting and understanding weather will certainly result. It is also clear that, with additional study and analysis, long-range weather forecasts will become more practicable. At the present time, the Army, the Navy, the Air Force and the U.S. Weather Bureau have plans for a considerably more important participation in the next Tiros launching than ever was envisioned originally. Units of the fleet, for example, have advised the Chief of Naval Operations that the data provided them from the first Tiros satellite constituted the most useful weather information yet made available to them. At the present time, the Tiros program is still influenced by research and development considerations. It is clear, nevertheless, that this system is in fact an actual operational system. With proper reorientation and planning, full utilization of a weather-satellite system readily could be obtained.

The present program does not permit direct read-out of weather data from the satellite at sea. Such a capability would be extremely valuable to a fleet which in its operations is vulnerable to weather influences, particularly those which affect aircraft launching and missile launching from ships. While this naval limitation is obvious, a much more broadening consideration exists in the simple fact that a U.S. weather satellite could be useful to the entire world. By opening up one's point of view, one can visualize readily an operational weather satellite doing a total world-wide job; the United States, after all, is just 2 percent of the area of the earth seen by a satellite. Such an effort can be

accomplished quite easily and quite directly with relatively little additional complexity of the entire program. For example, current estimates are that the present weather-satellite weight could be reduced by a factor of two without significantly degrading the useful information. This reduction in weight could provide opportunities for launching the satellite with considerably cheaper vehicles, reduced in cost by a factor of one-half. More important, the system are susceptible to analysis by modern high-speed computers coded for this mission. The system readily could be handled by the United Nations and would fulfill some of their highest objectives in serving the world community.

Therefore, we find that the weather satellite, originally planned as an exploratory R&D experiment and basic feasibility demonstration, is in fact being used operationally by the Armed Services and by the Weather Bureau, and its full operational utility is limited only by the enthusiasm, vigor and foresight of those willing to exploit fully the opportunities which readily are available to them.

Another example of a near-operational satellite system is represented by Transit, the navigation satellite. Here again the satellite originally was designed to answer simple feasibility questions. The excellent performance of the first two Transit satellites, however, has exceeded considerably the expectations of the original program. As a matter of fact, the results and accuracy are so good that these satellites could be used now to navigate ships, and aircraft, had the program been so geared for this unexpected opportunity.

The unanticipated high accuracies in the initial Transit program have led to the possibility of now fabricating an operational geodetic satellite. Extended geodetic satellite measurements could, with great precision, determine the shape of the earth, the earth's gravitational field and the precise locations of specific points on land masses and beneath the oceans. Such a satellite requires no new research and development; it is a straight-forward engineering job which can be scheduled and programmed for early accomplishment. Here again is a practical, useful and necessary satellite which can be put together to do a full operational job.

In the area of satellite communications there have been three primary accomplishments, Score, Echo and Courier. The President's Christmas message, carried by Score, was indeed an impressive, timely and effective "first" for the U.S. Courier is an advanced development of this type with emphasis toward relay technique.

The recent launching of Echo has created considerable interest; first, because it can be seen so readily all over the world; second, because of its enormous size for so simple and flimsy a construction, and third, because of its communications demonstrations which include transatlantic reflections. Echo will continue to be an effective tool for many months to come even though it has begun to lose its spherical shape and is becoming crumpled. Recent photometer measurements by the Naval Ordnance Test Station, China Lake, indicate that there is a good possibility that the transmissions may actually improve!

Other space craft stabilized with respect to the earth by means of small magnets (as in Transit) are readily envisioned.

Industry Participation

The operational opportunities for satellite communications are numerous; global telephone and global television are some obvious examples. The most important single develoment in satellite communications is the recent real interest of industry. There can be no doubt that truly operational communication satellite systems are now possible and that full participation by U.S. industry with its capability and hardheaded engineering approach will be the major factor in the early practical utilization of space. U.S. industry should be encouraged strongly to continue to increase its consideration of space systems which actually can be operational at an early date.

The Discoverer program has demonstrated already the ability to recover satellites from space. Such a technique offers many important opportunities for scientific research but may be rather luxurious for continuous operational use. This, of course, depends upon the value of the particular mission.

It is important to note that most of the operational satellites mentioned here weigh less than 500 pounds and are readily launched by Air Force boosters now available. With respect to future launching-vehicle development, there are two clear directions in which to proceed; one direction is the development of cheaper and/or more versatile launching vehicles. Examples of this approach exist in the Naval Ordnance Tracking Station (NOTS) aircraft-launched satellite vehicles, Scout, Sea Scout and Hydra. The other direction is towards larger vehicles. There is an excellent program in this area which employs Thor, Vanguard, Atlas and of course, the Saturn. Actually, a truly major step in the launching of very large payloads could be taken if one would immediately exploit the opportunities which are available in nuclear propulsion. Specifically, nuclear first stages could be launched and recovered at sea, thereby providing the mobility and safety required. Such a nuclear rocket system could be developed in much the same way that the Navy developed nuclear propulsion for submarines.

The future of man in space is, at this point in history, not clear. While I have no doubt that man will go into space, the missions that he will perform and the value of his contribution is not appraisable yet. It is, of course, clear that the non-manned space ships offer immediate operational opportunities. The manned space vehicles, on the other hand, will require considerable research and development before their operational capabilities are accurately evaluated.

Thus we see that unparalleled opportunities now exist for the immediate utilization of space for numerous satellite systems. This is precisely the type of engineering effort which American industry is most qualified to do. It is right down our alley and it is the type of undertaking at which we are best.

In conclusion, we cannot afford to overlook the fact that space can be used also as an area of operations against us. One must look in a sober way at the demonstrated Russian capability. The Russians may well be the first to put a man safely into space just as they were the first to launch a satellite, the first to reach the far side of the moon, the first to hit the moon, the first to orbit the sun, the first to launch enormous weights, the first to recover higher life forms from an artificial satellite, etc. They may continue this program and they might be expected to have on the shelf ready for immediate launching numerous operational satellites and operational space ships which can serve military and civilian objectives.

It is, of course, not possible in so short an article to enumerate all the operational opportunities which are available now employing space systems but the emerging facts now speak for themselves—a giant step has been taken, and "space is a reality." Now let's get on the ball and really exploit it!

HOW SEMO SIMPLIFIES

SYLVANIA ELECTRONIC SYSTEMS THROUGH SEMO COORDINATES

SYLVANIA ELECTRIC PRODUCTS INCORPORATED
AUTOMATIC ELECTRIC COMPANY
LENKURT ELECTRIC COMPANY, INCORPORATED
LEICH ELECTRIC COMPANY

S DELIVERY OF DEFENSE SYSTEMS

Now under the single direction of your representative in SEMO—Systems Engineering and Management Operation for Sylvania Electronic Systems—are all the resources of General Telephone & Electronics. Included are the vast technical skills and facilities of every subsidiary of this world leader in communications and electronics.

SEMO simplifies the job of obtaining complete defense systems by providing a single, responsible and accountable source for conception, evaluation, engineering and management of major systems. Systems-oriented in concept and personnel, it is staffed by members of the General Telephone & Electronics corporate family. And its sum of talent and experience assures completely integrated systems of specified performance, delivered on time at competitive costs. Benefits are quick-reaction capability, efficiency and financial accountability.

For full information on how SEMO can be of special service to you, write Sylvania Electronic Systems, a Division of Sylvania Electric Products Inc., Waltham, Massachusetts.

SYLVANIA **ELECTRONIC SYSTEMS**
Government Systems Management
for **GENERAL TELEPHONE & ELECTRONICS**

GENERAL SYSTEM

S THE DEFENSE SKILLS AND FACILITIES OF

ELECTRONIC SECRETARY® INDUSTRIES, INCORPORATED
GENERAL TELEPHONE & ELECTRONICS LABORATORIES
GENERAL TELEPHONE OPERATING COMPANIES
GENERAL TELEPHONE & ELECTRONICS INTERNATIONAL

PROJECT TURNKEY

Armed Forces Communications and
Electronics Association
1624 Eye St. NW
Washington 6, D. C.

SIGNAL STAFF REPORT

ACCORDING TO POST OFFICE Department officials, daily mail volume by the end of this year will reach 65 billion pieces, and by 1985 will reach 140 billion pieces. Since standard postal facilities were inadequate to handle such an increase in volume, an automated Post Office, Project Turnkey, was designed to show that electro-mechanical machinery could help to solve this problem. The Providence, R. I. Post Office, so called because the entire post office mechanism is turned on and ready to operate as a unit by the turning of a key in its front door, is thus both a working post office as well as a practical day-to-day laboratory to test new machinery for application to key post offices throughout the country.

Turnkey—constructed by Intelex Systems Incorporated, a subsidiary of International Telephone and Telegraph Corporation—is capable of handling 1,500,000 pieces of mail a day. It is a mammoth transportation job and to accomplish this task a combination of three high-speed conveyor systems is employed. Each is designed to perform a specific function and to carry mail in different containers.

Towveyor System

Thus, the Towveyor system, an endless chain recessed in the floor, tows carts and crates of parcel post and trayed mail from the truck and railroad platforms to the sorting areas. Outbound mail for Providence and vicinity also utilizes the rolling carts and bins conveyance.

Another system of power and free conveyors, this one aerial, moves sacks of mail into the culling machines where letters and cards are segregated from small parcels, "flats" or manila envelopes, and miscellaneous mail pieces, and takes the processed and bundled mail in sacks out again to waiting trucks and railway cars for distribution to local and national post offices.

Mailflow System

The third and most extensive conveyor system, called Mailflow, glides trays of stacked or bundled mail from one processing operation to another within the building itself.

Monitoring and directing the main stream of sacks, pouches, trays and parcels as the various belts, chains and platforms move them along is a job somewhat like a traffic cop's at New York's busy intersection of Broadway and 42nd Street. To assure that the mails move smoothly and without bottlenecks, Intelex Systems Incorporated, contractor for the postal facility, has designed into the various systems means of coding the destination of each sack or tray. In this way, for example, sacks of mail leaving the post office for truck or train can be directed to any of 70 drop-chutes. Incoming sacks of parcel post mail may be keyed to storage, if they contain non-preferential material, and may be called into action from the working positions below. Trays of letters about to be fed through the mammoth sorters that separate mail to 300 destination bins, are coded by a card inserted in their sides. Electrical devices read the copper contact strips on the card and direct the tray to its proper destination—all at a speed of 80 feet a minute.

In all there are more than 17,000 feet of conveyors in the Turnkey post office. At key points, counting devices record and display in the main control tower the number of incoming and outgoing sacks, trays in storage. local mail ready for processing, and other information obtained from the conveyor movements.

The Turnkey Post Office was inaugurated on October 20 by Mrs. Arthur E. Summerfield, wife of the Postmaster General, when she spoke into a microphone and thus directed the mail-processing machinery to begin operation. Her voice was transmuted to electronic impulses to turn on the equipment by a communication system that can hitch as many as 100 conversations to a beam of invisible ultra-violet light. This system was developed by International Telephone & Telegraph Corporation. Unlike earlier light-transmission systems, which use low-frequency waves and are limited to a single channel, the ITT development works with high frequencies and can handle many messages simultaneously. Making up the equipment are a one-pound transmitter with an ultra-violet light bulb and a transistorized receiver weighing twice as much. According to ITT, the bulb provides the rays of invisible light along which the message travels. A photomultiplier tube in the receiver converts the light rays into electrical energy to produce the transmitted intelligence. The units can handle almost any information from any source, including teleprinters, tape readers, computers and voice and telemetry systems. Where a security problem exists, such as in military communications, invisible light can be transmitted to insure secrecy.

PROJECT HEAT

FOR MILITARY APPLICATIONS

In cooperation with research and engineering commands of the U.S. Armed Forces, Hunter Manufacturing Co. for more than twenty years has specialized in the design, development and manufacture of multi-fuel-burning heating systems.

Hunter heating systems with *sealed-in-steel* combustion are employed for a wide variety of military uses—for space and personnel heating in mobile shelters, in portable or fixed structures of many different types, in self-propelled vehicles, in ground support systems for missiles, in radar and microwave systems, etc.

Other types of Hunter systems are widely used in winterization operations, for engine pre-heating, for emergency heating requirements and for many other using arm operations. Hunter heating systems are designed for cold starts down to 65° below zero and are air-circulating in type with thermostatic controls. Uncontaminated heat capacities range from 15,000 to 300,000 BTU/hour.

If you have a problem involving the application of heat, Hunter can help you solve it.

Complete research and development facilities available. Contact:

SPECIALISTS IN HEAT FOR MILITARY APPLICATIONS

HUNTER
MANUFACTURING CO.

30531 AURORA RD. • CLEVELAND 39, OHIO

THIN ROUTE COMMUNICATIONS

a new electronic transmission tool

by RICHARD A. POWELL

Communication Products Department, General Electric Company

MORE THAN A CENTURY HAS PAST since Samuel F. B. Morse first invented the telegraph. Through the years new scientific developments continually have improved the telegraphic art.

Recent engineering achievements have culminated in a new electronic transmission tool designed primarily for military and governmental communicators, but useful in the future for civilian applications as well.

The Communication Products Department of the General Electric Company, Lynchburg, Virginia, has announced a new Thin Route communications system that fulfills many needs for highly reliable point-to point digital data communications. Distances from line-of-sight to upwards of 500 miles are possible.

There exist many military and governmental uses for this new communicator's tool. For example, a system designer having a need to connect two end locations separated by 20 to 500 miles, with several teletype or data channels (or their equivalent bandwidth) has had to rely previously on several media of less reliable and more costly natures. Generally to transmit relatively narrow bandwidth, system designers either utilize wire lines or install VHF or UHF radio relay systems. In certain instances microwave, conventional high frequency and for longer one-hop distances even tropospheric scatter systems have been selected.

If a given system need can be fulfilled by the transmission of data only (teletype, canned messages, telemetry, facsimile, etc.) this new Thin Route tool will satisfy the system requirement for 1/50th the cost of conventional tropo and as little as 1/10th the cost of wire lines.

The Thin Route concept is based upon relatively narrow RF bandwidths. It can be used for simplex, duplex or multi-directional transmission of initially up to 6 conventional 100-word-per-minute teletype channels (800 c. p. s. total bandwidth). Although General Electric's Thin Route system is particularly attractive over long distances, (100 to upwards of 500 miles, where over-the-horizon tropospheric scatter is the vehicle) it can be used competitively for line-of-sight or diffraction distances from 20 to 100 miles.

Conventional high channel capacity radio systems, line-of-sight microwave and tropospheric scatter, using frequency modulation, require RF bandwidths of up to 6 megacycles and more. Even if only one voice channel is required, at least 2000 to 3000 c. p. s. bandwidth is necessary without resorting to expensive speech digitalizing or compressing techniques.

Communication system designers continually trade certain variables— antenna gain, RF power output, bandwidth and possibly diversity arrangements— to achieve satisfactory operation over given system db path losses.

To date the trend in point-to-point communications has been to higher and higher channel densities. Military designers are now implementing 600 voice channel capacity systems utilizing microwave and tropospheric scatter. This trend has been a logical one to satisfy main trunking or "thick route" needs.

Still many organizations do not require or cannot afford even as much as one voice channel of bandwidth. These users now primarily rely on leased lines or high frequency techniques. The cost to use conventional microwave or scatter RF equipment is prohibitive if the requirement is for less than one voice channel. (For example, only several data channels.)

Certainly where a user needs only several teletype channels, conventional microwave, VHF or UHF relay or FM scatter is a substantial waste of spectrum space and not an economical solution. As General Electric's new Thin Route Tropo concept is based upon narrowing the transmitted bandwidth and upon certain new equipment developments, obvious spectrum conservation and economics are accomplished.

From a frequency allocation standpoint, since only 150 to 800 cycles of total RF bandwidth are used, complete networks can be accommodated in only kilocycles of spectrum.

The real Thin Route Tropo benefit can be appreciated by looking at receiver thresholds. Good microwave equipment has receiver thresholds of around −110 to −115 dbw. Current FM tropospheric scatter work has produced a receiver with a threshold of about −125 dbw when used with a parametric amplifier front end. The receiver threshold of General Electric's Thin Route Tropo receiver is −171 dbw or 46 dbw lower than the conventional tropospheric scatter receiver and 61 db lower than a typical microwave receiver.

This 40 to 60 db lower threshold means the trade-off areas of antenna gain and output power enable more economical systems to be designed. For example, the difference between a 25 watt transmitter (+14 dbw) and a 50 kilowatt CW power amplifier (+47 dbw) is 33 db. Or the difference between a simple Yagi and screen reflector combination antenna (17 db) and a gigantic 120 foot antenna system (41 db) is 24 db. So by operating with a receiver threshold 60 db lower than conventional receiver thresholds, communications is possible with very small antennas and low-power transmitters. This is a basic precept of Thin Route communications.

Another key technique in Thin Route communication is diversity. Several diversity schemes are used by system designers to overcome sacrifice of carrier-to-noise ratios. Space diversity, frequency diversity, time diversity and angle diversity (multiple feeds on one dish) are all applicable to Thin Route communications.

General Electric has had a Thin Route Tropo system operating between its Communication Products Department's plant in Lynchburg and Washington, D. C., since January 1960. This circuit is a 152 statute mile, one hop tropospheric scatter system. This path has a total free

space and scatter loss of 205 db and a channel capacity of up to several radio teletype circuits. Results of the tests run on this circuit indicate that the tropo mechanism can be used for highly reliable, narrow band transmission employing low cost and simple RF and antenna equipment. In the test circuit, 60-word-per-minute start-stop teletype is used and a character error rate better than 0.12% for 99% of hours was obtained.

By restricting transmission to a few teletype channels, very simple antennas and low-power transmitters are used. On General Electric's Lynchburg-Washington feasibility circuit, three foot by four foot antennas weighing less than 50 lbs. are employed. The transmitter output power is 170 watts. Dual diversity reception is used.

General Electric is manufacturing basic Thin Route Tropo equipment on a building-block basis. Fixed plant, van or helicopter hut mounted terminals form the basic package. General Electric plans to expand the basic line into the vehicular and mobile field and it is entirely feasible that a terminal can be carried by one man.

The basic Thin Route transmitter is a 25 watt unit for fixed plant, short to medium distance use. A 250/500 watt power amplifier is available for longer hop use. Both the basic 25 watt transmitter and the optional 500 watt amplifier including all power supplies are contained on one side of one 19" relay rack.

A fixed plant diversity receiving terminal including two receivers and their combiner for diversity, a high stability oscillator (1 in 10^8 stability) monitoring functions and power supplies again are housed on one side of one 19" rack.

Although this new tool can be used for shorter distances, its particular attractiveness is on tropospheric type distances. Thin Route communications is less vulnerable to manmade and natural disaster than microwave or VHF relay, because use of the tropospheric scatter mechanism allows longer one-hop distances and eliminates costly repeater points. Use of very narrow bandwidths, scatter and small antennas make this system difficult to jam and easily hardened.

Thin Route communications is more reliable than the HF radio because it is operable in the UHF spectrum from 400 to 2000 megacycles, hence it is not subject to ionospheric disturbances.

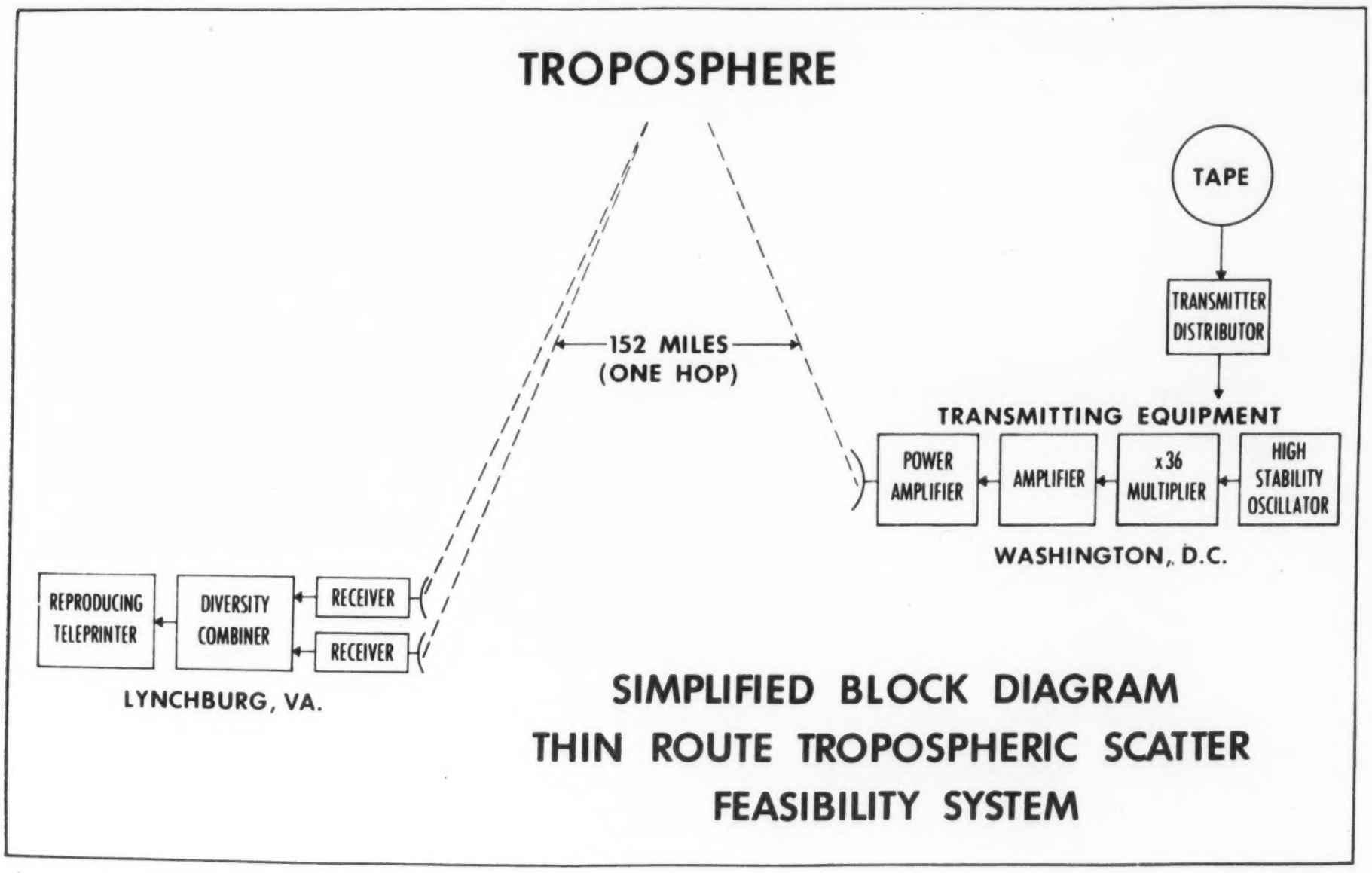
General Electric's Thin Route program will serve a variety of needs because the basic building blocks can be combined into many system configurations. For line-of-sight distances the basic 25 watt transmitter and one receiver (non-diversity) are available. For medium length (100-250 miles) tropospheric paths the optional higher power 250/500 watt amplifier along with dual diversity reception will satisfy most requirements. For the longer paths (up to 500 miles and more) the basic 25 watt transmitter can be used to excite even higher power amplifiers and quadruple or angle diversity schemes can provide a system package.

A terminal end of all necessary RF equipment and antennas, less terminal equipment, for a 4 to 6 channel medium range (up to 150 or 200 miles) one-hop tropo system is about $12,000 or $24,000 per hop.

Thin Route Tropo offers reliability, economy, data capability, distance, less vulnerability and a system that is difficult to jam. This concept adds another tool to those available to communicators.

Typical military uses of this new, flexible product are for missile ground environment communications, strategic, fixed plant, ship-to-ship, ship-to-shore, mobile and transportable tactical, secure intelligence and hardened communications. Governmental users could implement Thin Route systems for law enforcement, toll roads, park and forestry service, weather reporting, etc.

It is another scientific stride forward in the art of telegraphic transmission and the latest in the list of constant technological improvements made since Samuel Morse first tested the telegraph in 1835.



SIMPLIFIED BLOCK DIAGRAM
THIN ROUTE TROPOSPHERIC SCATTER
FEASIBILITY SYSTEM

— GOVERNMENT —

EXPLORER VIII, the United States' "spinning top" satellite, is probing the ionosphere in an effort to aid scientists in pinpointing the "window" through the ionospheric ceiling so that interference-free communications to space can be achieved. Launched November 3 by the National Aeronautics and Space Administration, the 90-pound aluminum-coated satellite is taking direct, continuous readings of the upper layers of the ionosphere, the area beginning about 50 miles above the earth and extending several hundred miles into space.

OCDM REGIONAL ADVISORY COUNCILS have been created to advise the Office of Civil and Defense Mobilization Regional Directors. Council members, who will serve without compensation, will include representatives from industry, communications, labor, government and other fields. Each of the eight councils will consist of five members who will assist one of the eight Regional Directors in coordinating OCDM plans and programs in his region.

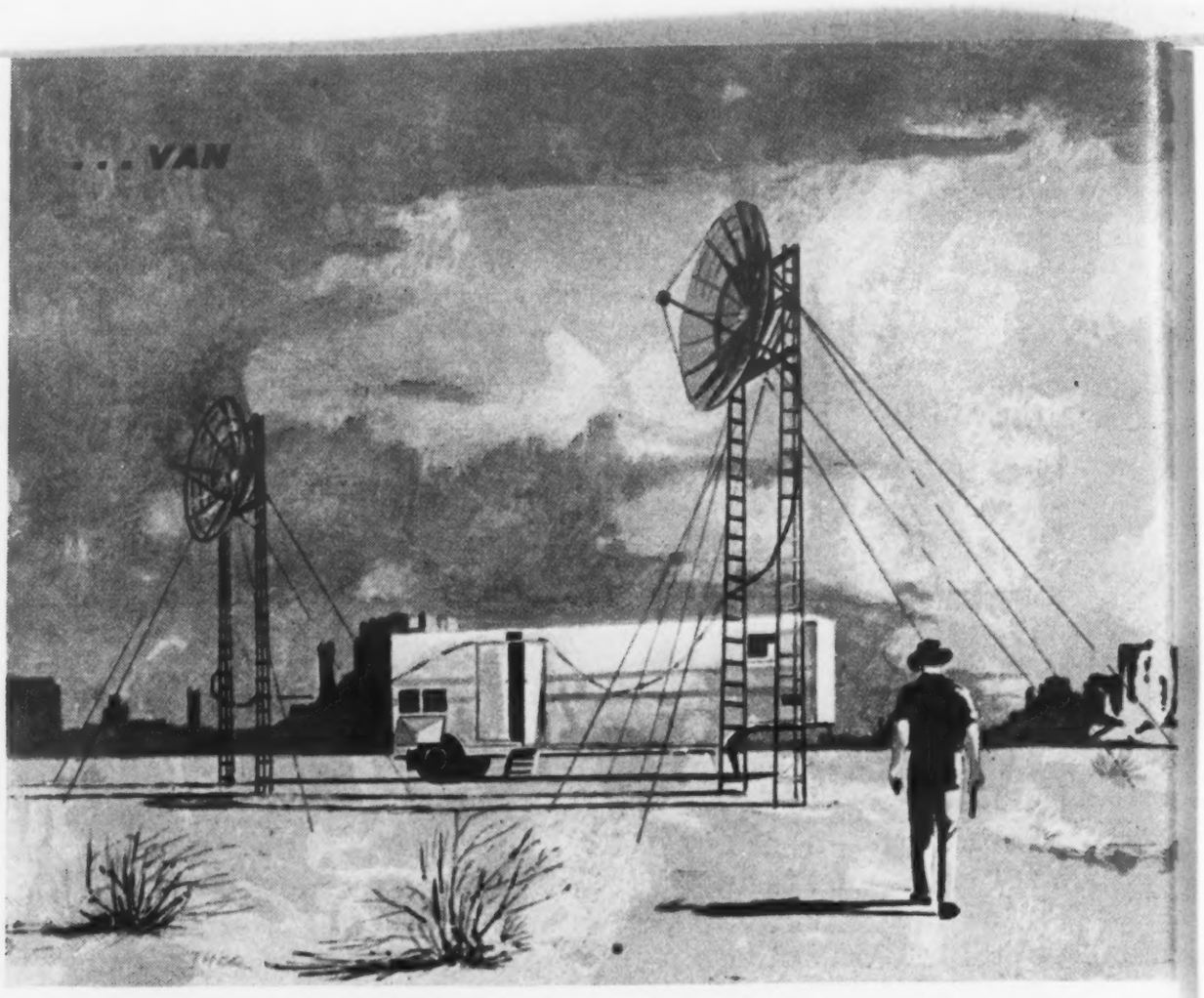
DETECTION STATION for underground nuclear explosions was completed near Fort Sill, Okla., in October. The station is being called the Wichita Mountains Seismological Observatory and is part of the United States seismic improvement program known as Project Vela. The Observatory has been developed and will be operated by the Geotechnical Corp., under the technical supervision of the Air Force Technical Applications Center. The program is under the over-all direction of the Advanced Research Projects Agency.

SENATE COMMITTEE ON GOVERNMENT OPERATIONS recently conducted a study on documentation, indexing and retrieval of scientific information. This report lists the information processing and retrieval programs presently being carried on by government agencies and private companies. Nearly 300 pages long, the report states that eventually the Federal Government may be compelled to establish a center for information exchange in order to bring all areas of science into a central clearinghouse. This center would provide services to Federal agencies or industries operating in several areas of science as to where required information is being stored and may be available, and would determine whether or not other special centers should be established to service specific science programs.

ARMY COMMUNICATIONS SECURITY AGENCY celebrated its fifth anniversary in October. The agency, a Signal Corps field activity, is responsible for distributing and maintaining complex technical equipment for the protection of the communications of the entire U. S. Army, and for several other Federal agencies as well.

NATIONAL EMERGENCY ALARM REPEATER SYSTEM is a new indoor warning device said to offer the greatest potential for reliable home warning in case of enemy attack. The NEAR System operates from a signal created by special generators on commercial electric power lines. Located in existing power company substations, the generators convert a small portion of the normal 60-cycle current to the 240-cycle warning signal needed to activate the device in the home. When activated, the device produces a loud distinctive buzzing sound. Sponsored by the Office of Civil and Defense Mobilization, the warning device was demonstrated recently in Charlotte, Michigan.

TECHNICAL ADVISORY GROUP will make recommendations to the Advanced Research Projects Agency on its Project Defender, a program to discover advanced means of countering enemy ballistic missiles. The recently-established group is composed of representatives from four laboratories involved in ballistic missile defense research under ARPA contract. They are Lincoln Laboratory of Massachusetts Institute of Technology, Stanford Research Institute, Cornell Aeronautical Laboratory and the Willow Run Laboratory of the University of Michigan. (*Continued on page* 25)



CUSTOM DESIGNED AND PACKAGED TO INDIVIDUAL REQUIREMENTS

COLLINS SCATTER TERMINALS ARE ON THE MOVE

Whether adding mobility to tactical command communications or simplifying complex installations in remote areas, Collins Transportable Transhorizon Systems give a new degree of flexibility to scatter communication. Packaged in a wide range of configurations, they include van-installed ground transportable stations and air transportable stations in varied sizes. The self-contained station packages have been designed and constructed under concepts of the U. S. Army Signal Corps and other government agencies. These compact systems, operating in the 2,000 or 1,000 mc bands, meet the requirements for easy transportability, quick set-up, mechanical ruggedness, packaging flexibility and high performance.

For further information and technical literature, contact Collins Radio Company, Texas Division Sales, 1930 Hi-Line Dr., Dallas 7, Texas.

COLLINS

COLLINS RADIO COMPANY • DALLAS, TEXAS • CEDAR RAPIDS, IOWA • BURBANK, CALIFORNIA

CONTRACTS: ARMY: Sperry Rand Corp., further research and development on Sergeant surface-to-surface guided missile system, $3.1 million; Western Electric Co., production of 3,020 electron tubes, $2.2 million; Packard Bell Electronics Corp., Technical Products Div., production of electronic subsystem for field army radio relay communications system, nearly $1 million. Navy: Lockheed Aircraft Corp., additional production of turboprop submarine hunter-killer aircraft, $53.3 million; General Dynamics Corp., Convair Div., production of Terrier all-weather, surface-to-air guided missile components and Tartar supersonic, surface-to-air guided missile components, $32.5 million; Sperry Gyroscope Co., design, manufacture and installation of navigation subsystem equipment for five Polaris submarines, $4 million (letter contract with maximum liability for this amount). AIR FORCE: General Electric Co., Heavy Military Electronics Dept., operation and maintenance of radar sets overseas, $1.5 million.

— INDUSTRY —

AEROJET-GENERAL CORP. is studying a way to provide pilot control of Titan intercontinental ballistic missile rocket engines so that the engines can be used in the Dyna-Soar program. The Dyna-Soar glider is designed to orbit the earth and reenter the atmosphere under control of a pilot for a conventional landing. Because of the proven reliability of Titan engines, according to Aerojet, very few changes are planned for their use in Dyna-Soar. A principal change is the installation of monitoring circuits so that ground stations, the pilot, or an automatic system will be aware of changing conditions and have control of the engines.

RADIO INTERFERENCE FILTERS designed for use on critical military equipment have been developed by All-Tronics, Inc. of New York. The pre-engineered, standardized filters can be installed in any piece of 400 cycle electronic equipment that generates radio interference. Filters are available in seven basic case sizes, voltage ranges of 150 VAC and 250 VAC, current ratings of 0.40 amperes to 100 amperes and six different types of mounting brackets.

SUBCONTRACT MANAGEMENT was discussed by Air Force and industry representatives at a conference held at Wright-Patterson Air Force Base, Ohio, in October. About forty-five members heard reports of six working panels which had been appointed a year ago to study important specific areas in subcontract management. Twenty-one companies participated in the conference.

ELECTRADA CORP. has developed an electronic unit which provides a display and control link between the human operator and high speed data processing or communications systems. Called the Datacom, the new unit will be used for message composition, editing, routing and similar functions. In operation, the Datacom unit accepts digital information at computer or teletype speeds, translates it into common words and figures, and displays it on the screen of a cathode ray tube. The operator can alter each message in part or in total with a standard typewriter keyboard. Incoming or outgoing messages are held in the display screen or in the unit's memory drum until the operator punches the "send" button. This causes the information to be retranslated and transmitted automatically to the associated communications network or computer.

DOD USE OF INDUSTRY STANDARDS has been hampered in certain cases because the industry standards offered are "minimum standards which, when specified, would permit the use of the lowest quality of product consistent with user needs," according to L. D. Price, Manager, Engineering and Safety Regulations Dept., National Electrical Manufacturers Assn. The Defense Department should inform industry of the minimum acceptable characteristics of a product, Mr. Price believes, and then industry will be able to develop standards acceptable to the Defense Department. Mr. Price's comments are contained in an article entitled "A New Approach on Government-Industry Problems" in the July-August issue of The Quartermaster Review.

BROAD-BAND COMMUNICATIONS SYSTEM has been developed which can conceal from an enemy the presence of a military command being transmitted over it. Designed by General Electric Co., the Phantom system uses a special form of double sideband transmission, resulting in transmission bandwidths said to be much greater than those found in conventional practice. In order to receive the Phantom transmissions, a receiving station must not only have the proper equipment, but also knowledge of the operating frequency and the specific signaling waveform being used. Phantom equipment is designed for use in long-haul, high frequency circuits where multipath conditions are encountered; however, it can be operated at frequencies much lower or higher than high frequency without any major design changes. (*Continued on page* 28)

POINTS OF DEPARTURE

ONE-STOP SHOPPING FOR THE ON-SITE TITAN COMMAND CONTROL SYSTEM A supermarket for systems—that's one way to characterize Stromberg-Carlson's systems capability. USAF officers found everything needed to develop the on-site Titan ICBM Command Control System under one roof at Stromberg-Carlson.

Name the components that must be integrated in such a system — computers, data transmission, processing and display, automatic test equipment, high-speed teleprinters. Stromberg-Carlson is engaged in state-of-the-art development and production of every one of them.

And there's another important fact that will get the Titan project off the pad fast. That's Stromberg-Carlson's unique brand of systems management. We call it Core Concept. We maintain a permanent staff of top scientists, engineers, technicians and management people — plus a group of prime capability sub-contractor companies — *in advance of systems proposals*. With our complete systems team permanently pre-assembled, we're able to move ahead at full speed once a systems contract is awarded.

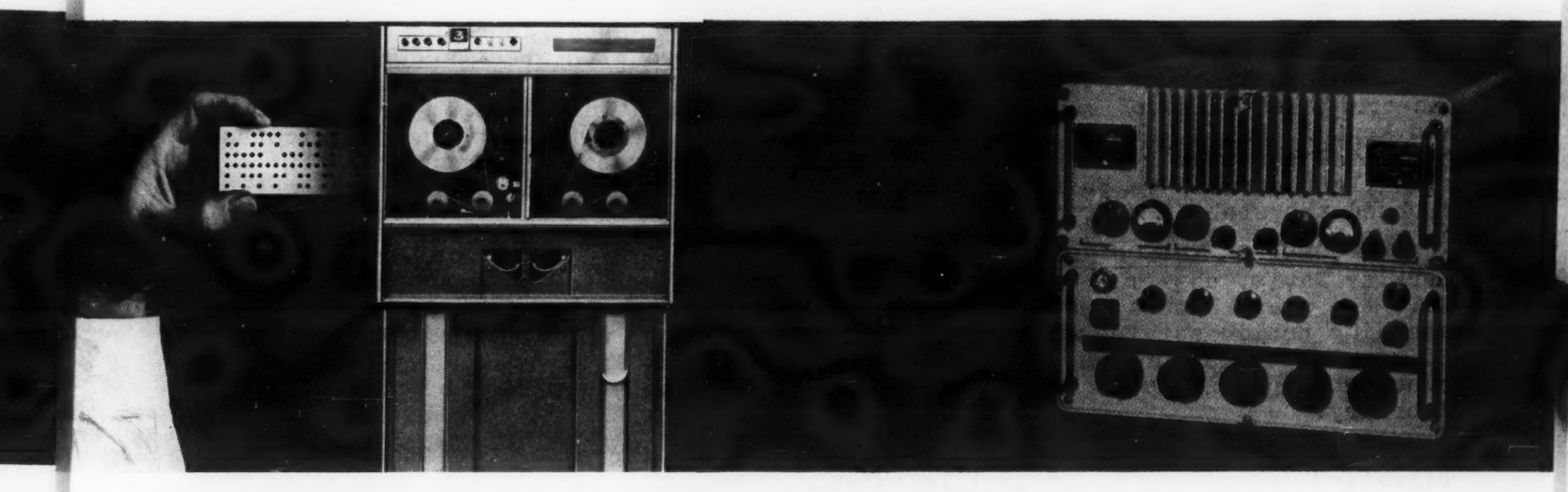
And cost? Core Concept efficiency should reduce systems management costs significantly. If this sounds attractive, why not let one of our systems experts explain all the details to you.

100% FASTER SPEEDS WITH THIN FILM STORAGE
Today's computers are fast, but they can move a lot faster. Currently, S-C scientists are investigating one of the most promising ways of helping computers live up to their ultimate capabilites. Underway is an extensive study of thin magnetic or dielectric films and their application to high-speed storage systems.

At present, operation of high-speed computers is deterred by the access time to stored information of conventional magnetic core storage systems. Magnetic films have the potential of providing an access time to stored information approximately 100 times greater.

The application of solid-state devices, in conjunction with thin magnetic films, can permit an entirely solid-state storage system with such major advantages as lower cost per bit and increased storage density as well as reliable higher speed of access time.

Investigations will also be made of other promising devices such as cryotrons, tunnel diodes, and partial switching of ferrite cores. This program is only one of Stromberg-Carlson's numerous basic research projects now in progress in all areas of communications science and advanced electronics.



SINGLE SIDEBAND TRIUMPH: 100 WATTS AND IT FITS IN A HATBOX This compact transceiver, weighing just 60 pounds, is the Stromberg-Carlson Single Sideband S-C 901A. Total volume is 3650 cubic inches. It generates 28,000 frequencies from 2 to 30 megacycles.

But here's the real reason we think the unit is a feather in our cap. Along with lightness and compactness, it incorporates comparable improvements in economy, reliability and operating ease.

There's click-stop tuning that allows an operator to pick his frequency in no time at all. Frequencies have a stability of one part in 10^7 per week. The unit is highly transistorized. A unique heat-sink design eliminates forced-air cooling. With a peak envelope output of 100 watts, it draws less than half the power of comparable AM equipment.

At Stromberg-Carlson, we are currently developing equipment for BuShips to be used both as primary high frequency equipment and as standby equipment. And we're adapting features of our sets to air-borne units for the Air Force and the US Army Signal Corps. If you're interested in the S-C 901A transceiver or other advanced Single Sideband equipment, just write for the specifications.

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**
1400 N. GOODMAN STREET / ROCHESTER 3, N. Y.

Signalgram (*Continued from page* 25)

COMMAND COMMUNICATION SUBSYSTEM of the radio launch control system for the Minuteman missile will be developed by Sylvania Electric Products Inc. The subsystem will provide for highly reliable transmission of commands from the Minuteman launch control facilities to the silo-stored missiles and, simultaneously, to all other launch control facilities in the missile squadron, according to Sylvania. The company is performing the work on the Air Force-developed solid propellant ICBM under a $7.5 million contract.

TELAUTOGRAPH CORP. has introduced a new line of telescribers said to increase the scope and usefulness of handwritten wire communications. Key advantage of this system, according to the California firm, is that the operator writes directly on paper. Another new feature of the system is that the user can create carbon copies on the transmitting unit.

— GENERAL —

TWO U. S. SCIENTISTS won the Nobel Prizes in chemistry and physics, respectively. Dr. Willard F. Libby, a former member of the Atomic Energy Commission, was honored for his development of an "atomic time clock," a device which can be used to determine the age of fossils, wood and other organic matter by measuring the amount of radioactive carbon present. Dr. Donald A. Glaser received the physics award for his development of a highly sensitive device, known as a bubble chamber, for detecting sub-atomic events. Both scientists are at the University of California.

WAVELENGTH OF LIGHT has been adopted as the international standard of length. Using this wavelength, the meter will be slightly shortened but less than 1/5000 part of the thickness of one thin dime. The new definition of the meter relates the measurement to a constant of nature, the wavelength of a specified kind of light which is believed to be unchangeable and can be reproduced with great accuracy in any well-equipped laboratory. The meter is now defined as 1,650,163.73 wavelengths of the orange-red line of krypton 86. Previously, a platinum-iridium metal bar, which was kept in Paris, served as the international standard for length. Duplicates of the metal bar were kept in the standards laboratories of other countries but occasionally these had to be returned to Paris for recalibration. Also, some scientists doubted the stability of the metal bar.

NOMINATIONS FOR EDISON RADIO AMATEUR AWARD are now being accepted, according to L. Berkley Davis, chairman of the award committee. Given annually by General Electric Co., the award honors the licensed radio amateur who has performed the most outstanding public service during the year. Nominations must be submitted to the Edison Radio Amateur Award Committee, GE, Owensboro, Ky., by January 2, 1961. The award which consists of a $500 cash prize and a trophy cup will be presented in February.

OPERATING RANGE OF CITIZENS RADIO EQUIPMENT can be increased by effective antenna elevation, according to an article entitled "Antennas for Citizens Radio" in the November issue of Electronics World. Although there are regulations limiting the height of the antenna to 20 feet, there are no restrictions on the elevation of the antenna, the article states. It suggests that the range of a Class D Citizens system can be increased by putting the antenna on one of the following elevated places: the roof of a tall building, the transmitting tower of a radio station, or on a TV antenna mast.

SPACE RESEARCH CENTER FOR WESTERN EUROPE is to be established at Queen's University in Northern Ireland. The university will receive financial backing from the United States for the space center. Spending on the project in the first year will be approximately $200,000 and will probably continue at the rate of $56,000 annually, according to the British Information Services. An agreement was signed recently in Belfast by university officials and representatives of the U. S. Navy European Research Contracts Office, acting for the Advanced Research Projects Agency. The main work at the new center will be to extend current research on the properties of atoms and molecules.

CALENDAR OF EVENTS

DECEMBER 12-15: Industrial Building Exposition & Congress, Coliseum, New York City.
DECEMBER 13-15: Eastern Joint Computer Conference, Hotel New Yorker and Manhattan Center, New York City.
JANUARY 8-12: Thermoelectric Energy Conversion Symposium, Statler-Hilton Hotel, Dallas, Texas.
JANUARY 9-11: Reliability and Quality Control Symposium, Bellevue-Stratford Hotel, Philadelphia, Pennsylvania.

TRANSMISSION ENGINEERING AND QUALITY CONTROL

by MAJOR JAMES R. BEAN, USAF
Airways and Air Communications Service

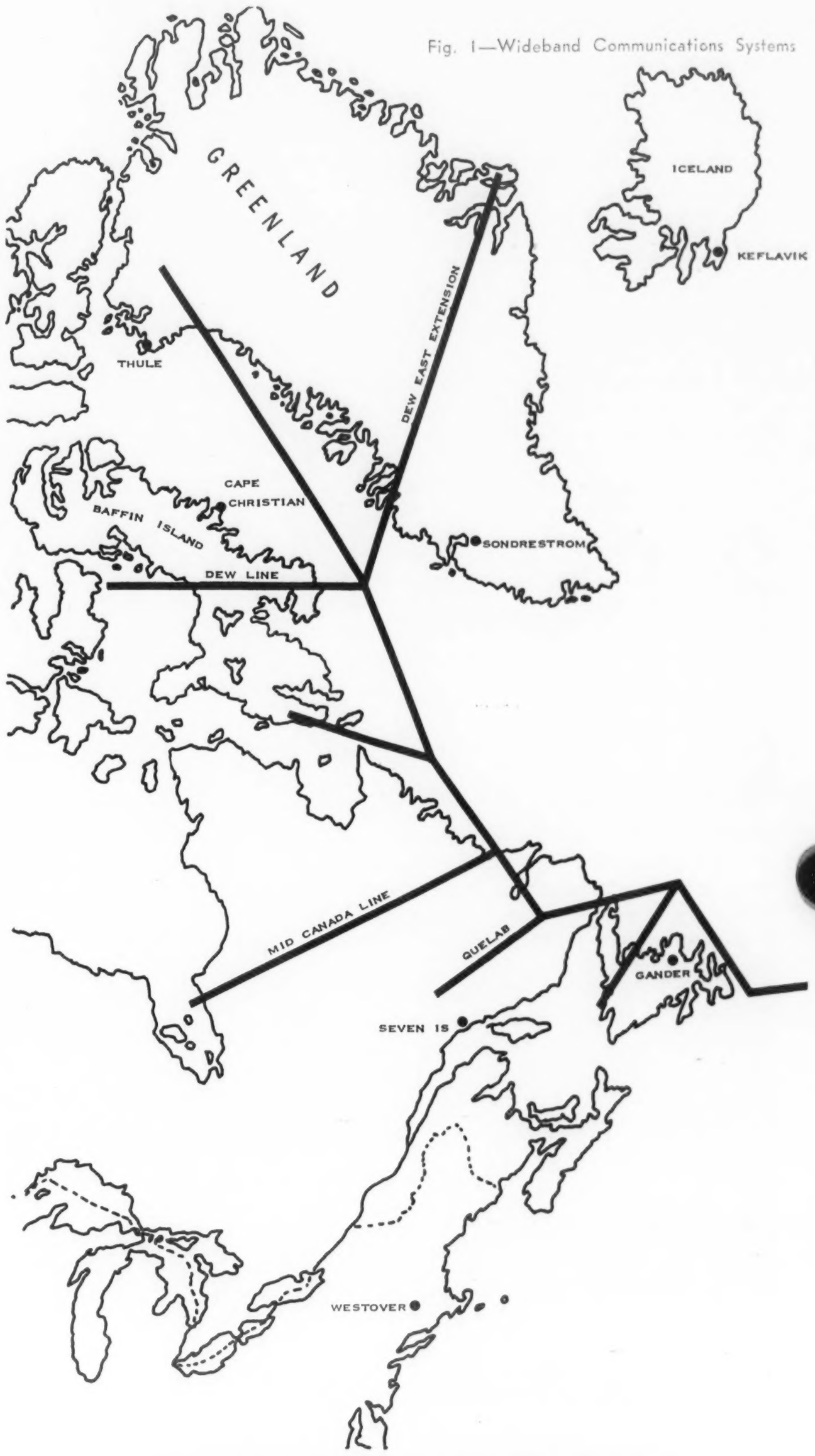
WHAT ARE TRANSMISSION engineering and quality control? These are new terms to many communicators in the Air Force as well as the other Services, although they have been in use by commercial long lines communications companies for years. With the numerous wideband communications systems being installed and more in the planning stage, the functions of transmission engineering and quality control will become well known to USAF communications people in the next few years.

First, let's briefly define "Transmission Engineering and Quality Control." Transmission engineering, sometimes called circuit design engineering or ciruit layout engineering, is the process of designing individual communications circuits (voice, teletype, data, facsimile, etc.) over an existing communications system, or combination of systems. This design is from one customer termination to the other and considers transmission levels, distortion, and compatibility at each relay point over each transmission path to insure the highest circuit quality possible within the limitations of system design.

Quality control is the function of monitoring individual circuit performance to insure that the quality standards established by the transmission engineer are maintained over the entire circuit from one customer termination to the other. Control stations are designated by the transmission engineer to monitor and test individual circuits and insure corrective measures are taken before circuit or system quality degrades to a point where it is not usable.

Let us digress for a moment and explain the terms "wideband" and "narrowband" systems. First of all, wideband communications systems provide many voice, facsimile, data, and teletype circuits by means of carriers superimposed on submarine and landline cables, tropospheric scatter, and microwave relay links. A normal voice channel occupies approximately four kilocycles. The number of four kilocycle voice channels varies from 12 to 72, and as many as 600 are possible over some systems. Also any of these four kilocycle voice channels may provide twelve to 22 (60-, 75-, or 100-word-per-minute) teletype channels by using suitable teletype multiplexing equipment. Wideband systems are made up of relay stations and electronic repeaters which provide continuity along the circuit route. Signals are received, amplified and retransmitted at each station or repeater. The loss of a sta-

Fig. 1—Wideband Communications Systems



tion or repeater will usually mean a break in the system and circuits must be restored by alternate routing over other communications systems, if available. This relative lack of flexibility is characteristic of wideband systems.

By contrast, we also speak of narrowband communications systems which provide most of the USAF long range communications circuits at this time. These systems employ high frequency, low frequency, ionospheric scatter, and single sideband links which comprise the AIRCOM System between the United States and overseas bases. Each link provides four 60-word-per-minute teletype channels by use of the AN/FGC-5 multiplex equipment. The single sideband systems permit two or three voice and eight to sixteen teletype channels. These narrowband systems occupy no more than twelve kilocycles bandwidth of the frequency spectrum. This is in contrast to the wideband systems which may occupy as much as 2000 kilocycles bandwidth. Narrowband communication stations may provide circuits to several other stations located in a general area, especially if omnidirectional antennas are used. This flexibility is gained primarily by low frequency and is particularly valuable since a station which is completely off the air may be by-passed and continuity of communications is still possible.

Requirements

Up to this point we've mentioned the subject and explained briefly what we mean by these terms and functions. This is all very well, but why all this sudden emphasis on those things? Haven't we been operating communications systems for years where these same principles apply? This is quite true. Transmission engineering principles were, or certainly should have been, applied when our present systems were engineered. What has happened is that many of these systems were engineered as a separate entity with no requirement to interconnect circuits into other systems. In many instances the circuits provided by one system are not compatible with the circuits provided by another system. Special measures are required to provide compatible circuits. The addition of "black boxes" is usually required. These black boxes lower the quality of the over-all circuit and limit the flexibility of the system.

Another development which is adding increased emphasis to transmission engineering techniques is the growing number of wideband com-

munications systems operated by the Air Force. After a typical narrowband system is engineered, installed, and turned over to the operating agency, little remains to be done to improve the quality of the circuits over the system, assuming, of course, that maintenance and operating procedures are correct. In other words, circuit design is determined and fixed by system design. Any major change or improvement in circuit engineering will require a major change or improvement in system engineering.

Conversely, after a typical wideband system is engineered, installed, and accepted by the operating agency, the transmission engineering job is just beginning. To provide top quality circuits, each must be planned from customer to customer on an individual basis. Every change in the use of a circuit, retermination, or change in allocation requires re-engineering. This does not mean to say that narrowband circuitry requires no engineering. All communications circuitry requires transmission engineering on an individual basis to provide the best reliability and quality possible. The point is that the complexity of the job and the options available are of a much greater magnitude when circuits are engineered over wideband systems.

Transmission engineering principles must be applied in the design and engineering of both narrow and wideband communications systems. Compatibility must also be a prime consideration so that the circuits provided by one system may be extended through other adjoining systems. After system installation and acceptance is completed, these principles have limited application in narrowband systems, but have a wide continuous application in the design of circuits over wideband systems.

Quality control procedures have been used since the Air Force has been operating communications systems. In the USAF narrowband complex, quality control functions are performed by the Airways and Air Communications Service (AACS) Channel and Technical Control Facilities (CTCF). In the wideband systems these functions are carried out by designated main and sub-control stations along the route of the circuit. Each circuit order issued by the Transmission Engineering Agency designates a main control station which is responsible for the over-all circuit. This responsibility includes monitor, testing, over-all level adjustment, and trouble clearance. In the case of long distances where the circuit passes through several different systems, the main control station will delegate the authority for these functions to sub-control stations along the route which will be responsible to the main control station for their segment of the circuit. These control stations direct the activation of circuits in accordance with the circuit order and circuit layout issued by the Transmission Engineering Agency. After each station along the route has taken the required actions to connect the circuit and adjust the levels, the main control station will perform and direct the tests on the over-all circuit to insure the standards specified by the circuit order are met. If not, the transmission engineering section is informed and circuit re-engineering is required. If the standards are met, the circuit layout card serves as a reference and quality standard for future alignment testing and trouble shooting.

Summary

In summation, quality control begins with the design of each circuit and the standard which the transmission engineer sets. This standard is the basis of initial circuit activation by the main control station, the sub-control stations, and each relay station through which the circuit passes. It is also the basis for maintenance of circuit reliability and quality by the control stations involved.

In the North Atlantic and eastern Canada, Headquarters USAF, through Headquarters AACS, has established a Transmission Engineering and Quality Control Agency under the North Atlantic AACS Region, commanded by Colonel William E. Geyser. This office has the responsibility for transmission engineering and quality control of all USAF circuits in the area. After a brief introduction to the wideband communications systems in the area (see Fig. 1, p. 29), we will examine specific transmission engineering procedures required for a typical long haul circuit in the NORLANT Area.

The first high capacity wideband communications system in the area was the Newfoundland Long Lines System, installed in 1942, extending across the island of Newfoundland. In 1955 the Polevault Tropospheric Scatter Radio Relay Communications System was completed. This was the prototype operational tropospheric scatter network and provided reliable high quality multi-channel voice and teletype communications. Transmission engineering was a less complex problem at that time since it was a closed system and circuit allocations

(*Continued on page* 33)

Helping "man" the missiles at the Vandenberg Air Force Base is a new 3500-line automatic telephone intercommunications network installed by AE.

Advanced switching techniques permit this exchange to set up any desired combination of conference or command circuits in a matter of seconds, provide taping of conversations, and interconnect with outside lines via microwave.

Complex circuit routing such as this is not new with us—AE has had a hand in the development of specialized communications systems for the armed forces for over 50 years.

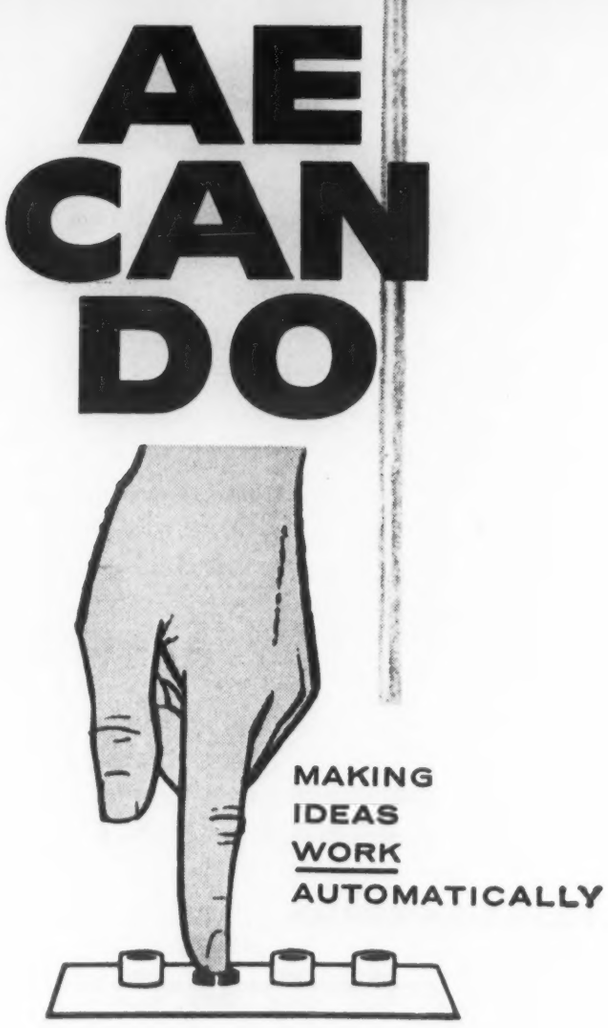
If you have a problem in communications or control, AE can usually supply the solution—as well as basic components or complete control systems. A letter or phone call (FIllmore 5-7111) to the Manager, Government Service Division, Automatic Electric Sales Corporation, Northlake, Illinois, will bring quick results.

AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM



were in most cases to operating locations and air bases adjacent to the network.

A year or two later other communications systems were completed which joined the Polevault System. Canadian National Telegraphs completed a microwave system across the Cabot Straits to Nova Scotia which provided quality telephone and telegraph communications from Newfoundland to the systems on the Canadian mainland and the United States. The Canadian Overseas Telecommunications cable joined England and North America. The Mid-Canada Line was completed and this high capacity communications system joined Polevault. The Dewline was completed to Cape Dyer, Baffin Island, and a tropospheric scatter link connected the Dewline to Polevault. In 1958 the Quebec-Labrador Tropo System was installed by the Bell Telephone Company of Canada which provided a high capacity system from Goose Bay to Montreal and the United States. This system joined the Polevault System at Goose Bay. In 1959 a submarine cable was completed from Cape Dyer to Thule Air Base, Greenland, and in 1960 a tropospheric scatter system was installed between Cape Dyer and Thule.

What is the significance of these communications systems which now join the Polevault System? Where Polevault originally provided circuits over a closed system, many of these circuits now became segments of much longer circuits. And now we come to the major point. Each of these communications systems was engineered by separate standards and with different types of equipment. This means that the circuits provided by one system are not necessarily compatible with circuits over another system. For example, the voice multiplex input and output levels of these systems differ from those of the Polevault System. Multiplex equipments are of different types which require breakout on an individual channel basis for through circuits. Teletype multiplex equipment used on the systems are not compatible and require telegraph repeaters for DC isolation. There are many such examples too numerous to mention. The key to the solution of these problems presented by interconnecting systems is transmission engineering and quality control on an individual circuit basis. Now we'll see what is involved in the engineering and activation of a typical circuit.

Circuit Activation

To illustrate the procedures and techniques of transmission engineering, some of the problems encountered, and the detailed coordination required, let's take a SAC voice circuit from Westover Air Force Base, Massachusetts, to Thule Air Base, Greenland, a distance of about 3,200 miles. We'll use this circuit, not because it was one of the most difficult to engineer and activate, but because it presents a complete picture of the different agencies involved, the coordination required, and typical circuit engineering problems.

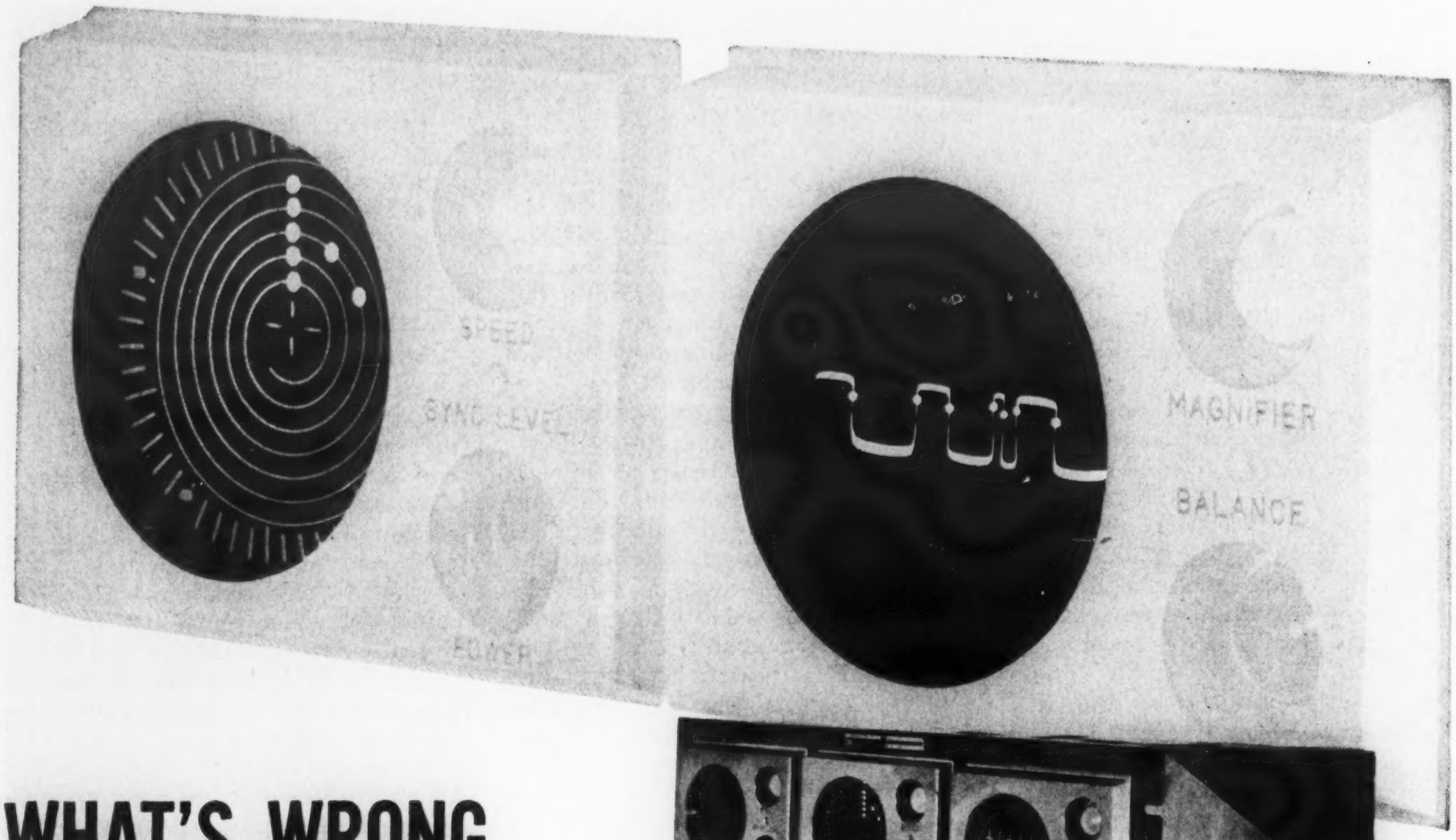
First of all, Air Force notifies SAC and AACS of the allocation. Headquarters SAC then issues a commercial service authorization for the commerical portion of the circuit. This commercial portion will be provided over American Telephone and Telegraph Company facilities from Westover to the Canadian border and Bell of Canada facilities to Labrador. The military portion then begins with the Mid-Canada Line facilities of the Royal Canadian Air Force, and connects with Polevault. The circuit is routed north via Polevault, and the Dewrear Tropo System operated by the Federal Electric Company to Cape Dyer. At Cape Dyer the BMEWS submarine cable facilities extend the circuit to Thule Air Base. This routing of the circuit requires coordination of the efforts of the following organizations:

- American Telephone and Telegraph Company, Long Lines Dept.
- Bell Telephone Company of Canada.
- Royal Canadian Air Force
- Federal Electric Company
- 1876th Radio Relay Squadron (Polevault)
- BMEWS Project Office
- Western Electric Company
- Eighth Air Force

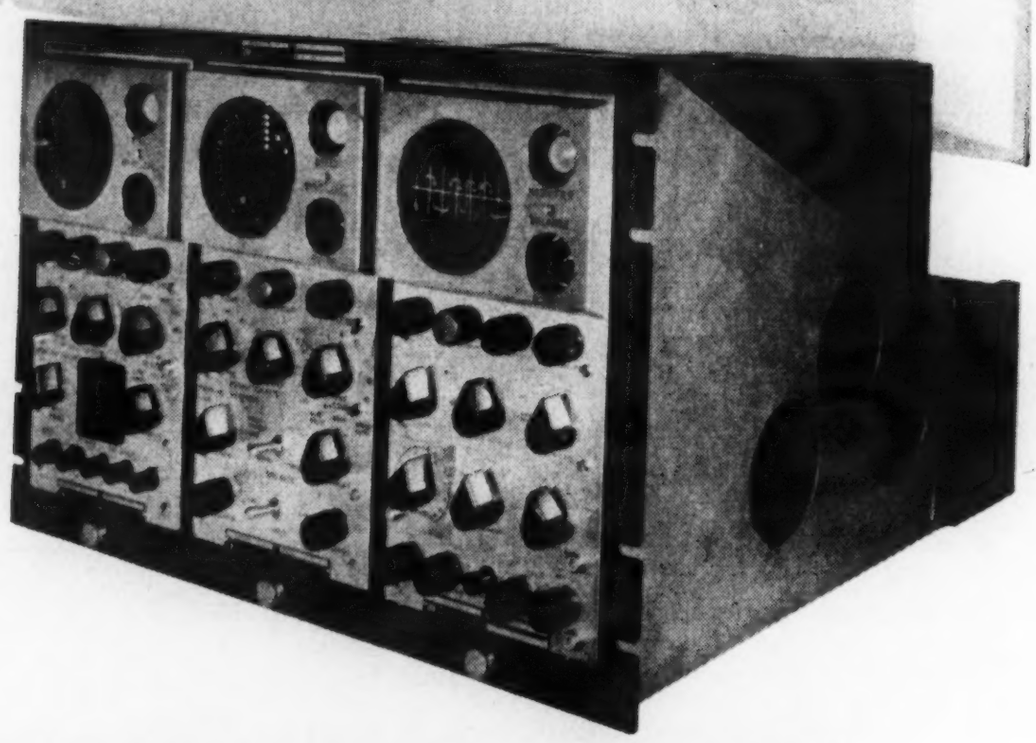
The following is a resumé of the major steps required and typical problems encountered in engineering and activation of this circuit. These steps and procedures are not necessarily in chronological order as many actions occur at the same time.

The first step required is to determine the exact nature of the terminations desired at each end of the circuit. USAF allocates circuits to the commands by general location. In order to engineer the circuit, the transmission engineer must know the type of termination such as four-wire to a handset, two-wire into a switchboard, or termination into keybox equipment. He must know the type of signalling required at each termination: push-button, switchboard ringing, or automatic ring when the handset is raised. These details are required for each termination and can

(*Continued on page* 35)



WHAT'S WRONG WITH THIS TELEGRAPH SIGNAL?



...and how do you find out without interrupting traffic?

The answer to the second question is Radiation's TDMS—Telegraph Distortion Measurement System—a compact, self-contained unit for on-line testing, analysis and monitoring of telegraph and data transmission links.

The TDMS detects, measures and analyzes signal distortion on a continuous basis, alerts even a non-technical operator that a circuit is deteriorating. Thus pinpointed, the malfunction (a badly-tuned receiver in a radio link, for example) can often be corrected with little or no circuit downtime.

For detailed information on the TDMS, write for Bulletin RAD E-100B to Radiation Inc., Melbourne, Fla. Address Dept. S-12

WHAT'S WRONG WITH THE SIGNAL SHOWN ABOVE? Character (letter R) shows a split 4th element, a result of poorly adjusted transmitting equipment. Spiral trace display on Telescan CRT (at left) indicates the presence, and analyzes the nature of characteristic distortion.

THE ELECTRONICS FIELD ALSO RELIES ON RADIATION FOR...

RADIPLEX–50-channel low-level multiplexer with broad data processing applications. Features rugged solid-state circuitry, almost unlimited programming flexibility, unique modular construction for compactness and exceptional ease of operation and maintenance.

RADICORDER–Multistylus recorder provides high-speed instantaneous readout for wide range of data acquisition or processing systems. Eliminates necessity of electronically translating complete data, thereby reduces computer work loads.

TELEMETRY TRANSMITTER–Model 3115 is a ruggedized 215-260 MC unit with extremely linear FM output under the most severe environmental conditions. With its record of outstanding performance in many missile programs, Model 3115 is specified by leading missile manufacturers.

RADIATION INCORPORATED

only be furnished by the user of the circuit who will know the particular manner he desires it to operate. For this particular circuit SAC desires that it be terminated in the SAC telephone net switchboard at Westover and in the base switchboard at Thule. This requires a two-wire termination at each end of the circuit with normal 20 cycle switchboard ringing.

At the same time this information is being supplied by SAC, contact is made with the Long Lines Department of AT&T who will perform the engineering of the commercial portion in coordination with Bell of Canada. Information is exchanged concerning transmission levels to be specified where the commercial and military portions of the circuit meet. This contact also insures that the commercial and military transmission engineering agencies have been notified of the new requirement and agreement is reached on a date the circuit will be turned up for service.

Information is exchanged with the RCAF to insure that arrangements are completed on the Mid-Canada Line for the circuit and to coordinate the transmission levels between the Mid-Canada Line and Polevault stations. The Federal Electric Company, the BMEWS Project Office, and the Western Electric Company are notified of the circuit allocation and similar information is exchanged concerning the routing of the circuit over the Dewrear System and the submarine cable from Cape Dyer to Thule. The Eighth Air Force Base Communications Officer at Thule is contacted to obtain base cable pair assignments from the submarine cable terminal to the switchboard. At Westover these arrangements are made by AT&T.

While this coordination is taking place, the transmission engineer is drawing up a preliminary circuit layout based on the information available in the engineering data files. Transmission levels are calculated for each station along the circuit route and resistive pads, repeat coils, and line amplifiers are inserted to establish these levels. At points where the proper value of pads is not available, the circuit design may specify a non-standard level (high or low), or specify an over-all level that may appear to be incorrect. There are several places in the North Atlantic Area where a 0.2 db to 0.9 db loss cannot be corrected at the station where it occurs. These non-standard levels will be brought back into line at another station along the circuit route. All levels of the over-all circuit are considered in the design, and standard transmit and receive levels are used if possible. This need to compromise at various points in order to provide a good over-all circuit is a frequent problem in circuit design and requires experience and judgement on the part of the transmission engineer.

Up to this point we have provided a talking path for the circuit. A means of signalling or ringing must also be provided. The ringing equipment at the Thule end of the circuit is provided by single-frequency signalling units in the submarine cable terminal which accepts the switchboard 20 cycle ringing and converts it to a 2600 cycle signalling frequency for transmission to the distant end of the circuit. This creates a problem in signalling compatibility since the only equipment available at the Westover end of the circuit is designed to accept 1000/20 cycle signalling (1000 cycles modulated at a 20 cycle rate). To provide compatible signalling on the circuit, arrangements must be made with AT&T or Bell of Canada to provide ringing conversion at some point in the commercial portion of the circuit. This is necessary since these converters are not available in the military systems. This conversion unit accepts the 2600 cycle frequency from Thule and changes it to 1000/20 which operates the ringers at Westover. The converse takes place when Westover signals Thule.

When the preliminary layout is completed it is coordinated with the organizations involved to verify that they have the required facilities to establish transmission levels, and to confirm channel assignments. After final design is completed, it is transferred to the circuit layout card for reproduction and distribution to the operating units. This card is a directive to the operating agency and serves as a standard for the initial activation of the circuit as well as future alignment, testing, and trouble shooting. The transmission engineer now becomes more of a coordinator and consultant. The circuit controller at the main control station is now the chief figure to see that the circuit is complete. How fast and how well it is installed will depend largely on his experience and ability. The best engineering would be of no value without good circuit quality control to insure that it is activated according to the design and maintained in that same manner. Also, an experienced controller will be able to find and correct discrepancies due to factors unknown to the transmission engineer.

This illustration of the engineering and activation of a voice circuit has pointed up the major steps involved

(*Continued on p. 37, col. 3*)

PART I

SIGNAL CORPS' ROLE IN A CENTURY OF R&D

by
DR. GEORGE RAYNOR THOMPSON
Chief
Signal Corps Historical Division

THE U. S. ARMY SIGNAL CORPS, now celebrating 100 years of service to the nation, was the first separate signal organization of any army in the world. We remember such highlights during this 100 years of history as: Civil War wigwag; meteorology and founding of the national weather service; the telegraph and telephone serving the Army in all wars since the Spanish-American war; balloons and photography before 1900; development of Army aviation early in this century; development of radio, especially radio-telephone, in World War I; development of Army radar and FM radio just prior to and during World War II.

These are merely some of the highlights before World War II, before the flood of communications-electronics development since that war,—a rising tide of activity to which the Signal Corps has deeply contributed, along with the other military services of the nation.

It is equally appropriate to emphasize some of the less known facts of early Signal Corps History. We need to remember the Corps' contributions to tactical combat—from Civil War incidents such as defense of Little Round Top at Gettysburg, and holding the fort at Allatoona, down to the testimony of a World War II officer who wrote "every soldier that lived through the war with an Armored Unit owes a debt he does not realize to General Roger B. Colton" for the advantages which FM tank radio gave us over the enemy. We need to recall the struggles of the first Chief Signal Officers to maintain the Corps in the late 1800's, before the wars at the turn of this century firmly established the fact that the Army has a permanent requirement for a communications-electronics organization.

And in this era of research, of government collaboration with science and technology, we need to recall Brigadier General Albert J. Myer's relations with the inventors and builders of the Beardslee tactical telegraph. We need to remember General Myer's and Brigadier General William B. Hazen's relations with meteorologists and their establishment of the Study Room—an early Army effort in research and applied science. We should remember the broad scientific interests of Brigadier General Adolphus W. Greely, from international weather research (the first IGY) in the 1880's to aeronautics and aviation in the 1890's and early 1900's. We should recall Major General George O. Squier, a Ph.D. in electrical engineering, who patented multiplex Telegraphy/telephony in 1911—a patent which is basic to carrier techniques. Squier, Chief Signal Officer during World War I and first chief to attain the rank of major general, brought Dr. Robert A. Millikan, the world-renowned physicist of the University of Chicago, into the Corps to head up a research division in the Washington headquarters OCSigO. Millikan in turn caused a former student of his, in microwave research, Dr. William R. Blair, to enter the Corps. Blair subsequently, in the 1930's, developed and patented Army's first radar, the search light control set SCR-268.

These and many other efforts and accomplishments of Signal Corps' 100 years of services should be remembered, bringing to mind the older, less known events of the first half century.

One hundred years ago Army assistant surgeon A. J. Myer had just completed a series of successful field tests of his wigwag system. He had made the tests, exchanging wigwag messages with an assistant, in the area of Ft. Hamilton, N. Y., Sandy Hook and Highlands, N. J.

One hundred years ago the Army was adopting Myer's system. On 21 June 1860 Congress authorized the appointment of a signal officer of the Army with the rank and pay of a major of cavalry. This date the Army now takes to mark the birth of the Signal Corps.

Nearly all the Corps' services in the Civil War involved visual signals —flags and torches. They were used in fixed lines of stations, as up and down the Potomac, whence originated the phrase "All Quiet on the Potomac." That was a stereotype message the flagmen transmitted down the line almost daily. Flags and torches were also used, even more importantly, in the rapid movement of marches and combat.

Those of you who visit that mass of monuments at Gettysburg will see the bronze tablet affixed to the topmost ledge of Little Round Top, commemorating the services of Signal Corps flagmen there during that crucial battle of 1863. You should know, too, that the tablet was placed there 16 May 1919, by the organization which has evolved into the Armed Forces Communications and Electronics Association. The parent organization was the U.S. Veteran Signal Corps Association which took form soon after the Civil War. It was added to by Signal Corps veterans of the Spanish-American War and of World War I. Since World War II, it has greatly enlarged into AFCEA through the addition of communications-electronics men from all the services and from industry as well.

The bronze plate on Little Round Top is, amid the thousands of Civil War monuments the country over, the only marker I know of which commemorates Signal Corps service in that war.

A Civil War site which deserves Signal Corps commemoration, if a park is ever developed there, is Allatoona, Georgia. The railroad junction and supply depot there was vital to General William Tecumseh Sherman during his Atlanta Campaign of late 1864. On 5 October the small Federal garrison at Allatoona received a savage attack from Confederates slashing into the rear of Sherman's lines. They cut the telegraph wire along the railroad to Atlanta. The only means left to Sherman for

Brigadier General Albert J. Myer, authorized as first Chief Signal Officer of U. S. Army on June 21, 1860.

rapid communication to the rear was wigwag—from Kennesaw Mt., on Atlanta's outskirts, 15 miles north to Allatoona. Wigwag messages could be read between the stations on the mountain and atop the Allatoona fortifications. By this means Sherman was able to call up reserves to help defend the fort and to order the holding of the strongpoint at all costs.

It was held throughout a desperate fight. Its commander, General John M. Corse, had a message wigwagged to the anxious Sherman at the end of the conflict saying "I am short a cheekbone and one ear, but am able to whip all hell yet."

I must add in the interest of truth, Gen. Corse was given to exaggeration. This message became well-known. Yet everyone in the post-war years could plainly see the General still had two ears. But no one dared to twit him about the matter.

General Sherman later reported to Secretary of War Edwin McMasters Stanton that it was the services of the Signal Corps which saved Allatoona that day. The drama of the signaling and the fight gave rise to a spirited song entitled "Hold the Fort." It became famous in one version as a gospel song. Other versions became popular with labor organizations both in this country and in England.

Although nearly all Signal Corps service in the Civil War involved visual flags and torches, there was also the flying field telegraph Major Myer developed, using the magneto-electric telegraph set he caused to be designed and built by an early telegraph engineer, H. J. Rogers, and a manufacturer, G. W. Beardslee. Myer worked closely with these men early in the war till the first wagon trains using these sets went into the field in 1862. The trains saw combat service throughout the Peninsular Campaign in the spring and summer of that year, and in the battle of Fredericksburg in December, 1862. Short-range and mobile, for tactical field use only, they did not compete with the long telegraph pole lines maintained by the Military Telegraph organization, actually a civilian group that served the War Dept. and Secretary of War Stanton. Rather, the Beardslee sets supplemented the heavily used Military Telegraph circuits. Myer's flying trains provided, in the hands of Signal Corps soldiers in the field, a service which directly supported combat.

Constant use was beginning to take toll of the Beardslee sets by 1863. Myer, by then a colonel maintaining his headquarters at 158 F St. in Washington (the building at 1905 F St., still stands, little changed as part of American University), began receiving adverse maintenance reports as the magnets and gears deteriorated from field use.

Realizing the inadequacy of these magneto-electric sets, Col. Myer now began seeking Morse code telegraphers who could operate the commercial type telegraph. But such specialists were rare as Secretary Stanton had cornered them all for his Military Telegraph. Myer, advertising in the effort to steal away a few, collided with the mighty Secretary. The result was as might be expected. Late in 1863 Col. Myer was suddenly removed from the head of the Signal Corps and banished, in effect, to the Division of West Mississippi.

Lieutenant Colonel William J. L. Nicodemus was thereupon made acting Chief Signal Officer. He remained in this capacity barely a year before he too ran afoul of the Secretary of War, and with identical results. Stanton removed him late in 1864, appointing Colonel Benjamin F. Fisher in his place. When news of this action came to Col. Myer in his western "banishment," he wrote to Mrs. Myer, in a letter of 2 January 1865 which is preserved in the Library of Congress, some interesting comments on the obvious hazards of service as Chief Signal Officer. He said of Nicodemus, who had recently married:

> Alas, poor Yorick. [Myer knew his Shakespeare—in this case, the play *Hamlet*]. He was crazy to have my duties and my responsibilities. He secured them for a few months, and now his sun is set. Just married and dismissed. I hope his wife will comfort him.

Colonel Myer fortunately did not consider it crazy that he should himself regain the duties and responsibilities of the CSigO, which he did in 1866. As soon as he won control over such commercial-type telegraph lines as the Army required, he next succeeded in a major gamble to win for the Signal Corps the task of a national weather service which Congress was seeking to establish. This success provided the mainstay of the Corps' existence almost up to the Spanish-American War. And it deeply involved the Corps in scientific research and in international scientific cooperation. Before his sudden death in 1880, Myer by then a brigadier general, had hired numbers of civilian meteorologists and he had attended conferences in Europe looking to international cooperation principally to collect Arctic data on an international scale.

End Part I

(Part II will appear in Jan.)

Transmission (*Con't. from p.* 35)

and a typical problem or two. Similar procedures are necessary to engineer, activate, and control facsimile, teletype and data circuits. From an analysis of these procedures it can be seen that four prime ingredients are needed to carry out the functions of transmission engineering and quality control in a given area or on a worldwide basis. The first requirement is accurate up-to-date engineering data and records of each communications system, characteristics of inter-connecting cables and links, and terminating equipment in use for any particular circuit. Second, there is a need for continuous coordination between the transmission engineer and the organizations responsible for operation of the communication systems. Third, the transmission engineer must have experience and use good judgement in his design of the circuit. Fourth, there must be competent control technicians in the main and sub-control stations to insure circuit quality.

Summary

The foregoing has outlined how the North Atlantic AACS Region is applying the principles of transmission engineering and quality control for USAF circuitry in the North Atlantic and Eastern Canada. It should be kept in mind that this description illustrates the information, coordination, and procedures required for one circuit. There are over 300 circuits in the North Atlantic AIRCOM complex on wideband systems alone. Circuit requirements are in a continual state of change and each change requires re-engineering or re-design to insure proper quality. This is the professional method for providing communications circuits that all using commands have a right to expect. Improvised hookups and cut-and-try methods will provide marginal circuits even when propagation conditions are most favorable. Complete planning and engineering before activation is the key to initial circuit reliability and quality. The application of quality control techniques in control, isolation of troubles, and monitor of circuit performance is the key to sustained reliability and quality. Use of these techniques will provide the best circuits which the communications systems are capable of providing. In establishing the Office of Channel Transmission Engineering and Quality Control, the Air Force has taken an important step toward realizing the maximum capability from its communications systems.

When communications history is made...
Westrex is bound to be on the scene!

El Al Israel Airlines recently announced the first telephone service for passengers on a transatlantic airline.

El Al's revolutionary Skyphone uses Westrex Type 59 Privacy and Westrex Type 58 Privacy

Ultra-compact and rigidly constructed, this transistorized airborne unit offers the ultimate in privacy when sending and receiving radio telephone messages from the air . . . a degree of privacy meeting the most exacting of telephone company standards.

Compact and reliable speech-privacy unit assures the privacy of conversations over point-to-point and ground-to-air radio telephone systems and commercial land-line telephone circuits simultaneously in both directions . . . using the latest in transistorized circuit design.

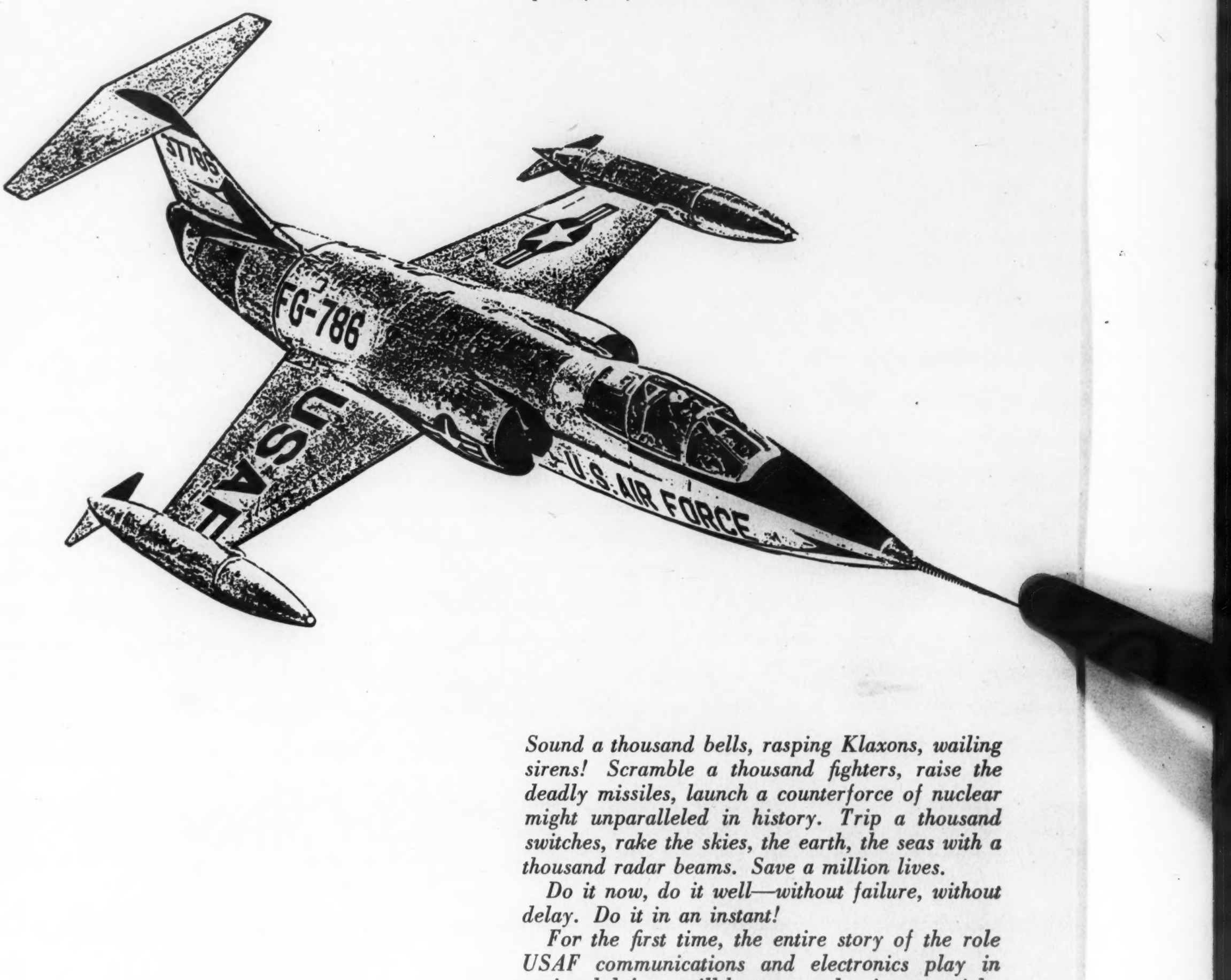
Investigate the advantages of this privacy equipment for taxicabs, police and fire departments, National Guard units, fishing fleets, and other 2-way stationary or mobile transmission services. *These are just two units from a complete line of outstanding quality products developed and manufactured by Westrex—a pioneer and world-wide leader in terminal communications equipment.*

For information, write Communications Equipment Dept., Section 161, 540 West 58 St., N.Y. 19, N.Y. 1625 I St. N.W., Washington 6, D.C.

Westrex Corporation

A DIVISION OF LITTON INDUSTRIES

IN AN INSTANT— *Flash the word around the world! Take a fleeting, nebulous electronic blip. Analyze it, interpret it, evaluate it, convert it into intelligence. Send it singing over thousands of miles of arctic wastes, thriving cities, peaceful farms — across oceans and continents.*



Sound a thousand bells, rasping Klaxons, wailing sirens! Scramble a thousand fighters, raise the deadly missiles, launch a counterforce of nuclear might unparalleled in history. Trip a thousand switches, rake the skies, the earth, the seas with a thousand radar beams. Save a million lives.

Do it now, do it well—without failure, without delay. Do it in an instant!

For the first time, the entire story of the role USAF communications and electronics play in national defense will be put together in one article. Look for it in the March 1961 issue of SIGNAL.

SIGNAL'S AIR FORCE ISSUE
MARCH, 1961

AN ACHIEVEMENT IN DEFENSE ELECTRONICS

412L Strengthens Air Defense By Integrating Airspace Management

Rapid coordination of all phases of military airspace management is a major problem of air defense. This simulated operations room depicts the heart of the Air Force's 412L Air Weapons Control System—a single, semi-automatic electronic complex which coordinates radar stations, data processing and display centers and weapons bases into a unified network.

Within seconds, 412L will provide the vital detection and tracking data to human decision makers. Precious time will be gained since computations leading up to the final decisions will be done automatically. In addition, 412L is a highly flexible system designed for use throughout the Free World. It will operate in mobile as well as fixed environments.

Currently going into prototype production, 412L has already anticipated technological advances. And, importantly, new equipment can be integrated into this versatile Air Weapons Control System in the future, assuring a complex which will remain combat-ready for many years.

176-05

Progress Is Our Most Important Product

HEAVY MILITARY ELECTRONICS DEPARTMENT
DEFENSE ELECTRONICS DIVISION • SYRACUSE, NEW YORK

GENERAL ELECTRIC

INDUSTRY DEVELOPMENT OF COMMERCIAL SATELLITE SYSTEMS

A SIGNAL STAFF REPORT

RECENT STATEMENTS by Government and industry officials give support to the belief that commercial satellite systems financed and operated by private companies, as distinguished from Government or military agencies, may become a reality within the next few years.

Dr. T. Keith Glennan, Administrator, National Aeronautics and Space Administration, has said that NASA will support "technically promising" private proposals for satellite communications systems on a "cost reimbursable basis." The space agency would provide rockets, launching and tracking facilities and technical services to companies. In addition, Dr. Glennan noted in his policy statement on October 12 that NASA would continue its research and development work on a commercial satellite communications system "only so long as is necessary to assure that timely development" of such a system "will be completed by private industry."

Henry T. Killingsworth, American Telephone and Telegraph Company Vice President in charge of Long Lines Department, recently stated that his company believes that "the commercial application of satellite communications is a job for private enterprise," and AT&T is ready "to take on that job and pay our own way."

Dr. James C. Fletcher, President, Space Electronics Corporation, in expressing his belief that the United States can achieve commercial returns from its space programs, noted that "appropriate incentives must be given to industry for using their own ingenuity and know-how to sponsor these (space) programs and to carry them out in efficient ways."

AT&T would like to put an experimental communications satellite in orbit in the next year or so. The satellite, which would provide experimental transmission of telephone calls, television and other types of communication between the United States, United Kingdom and continental Europe, would serve as the first station in a proposed international communications system. The system would use solar-powered satellites placed in orbit at an altitude of about 2200 miles. Each satellite would weigh about 175 pounds.

AT&T has said that it is prepared to contract for the launching of the necessary satellites for the system and is ready to proceed with the construction of transmission and receiving stations on the ground. The project would be financed and facilities operated by AT&T, in coordination with the telephone administrations abroad. This is similar to the practice for many years in handling overseas communications by cable and radio.

However, before AT&T can launch the experimental satellite, the company must obtain authority from the Federal Communications Commission. AT&T filed an application with the regulatory agency on October 21. It may be several months before the request is considered, according to FCC officials, since the FCC ordinarily does not expedite matters in handing down rulings on experimental projects.

For its part, Space Electronics Corporation believes that a satellite communications system could be built by industry, and the company has made cost estimates which show that a system utilizing six payloads placed in a 24-hour orbit would cost less than $25 million. "If such a system were built," Dr. Fletcher thinks, "it could be paid for in five to ten years using those lease rates per mile that are currently common in the television industry."

Satellite systems for purposes other than communications also are being considered by Space Electronics Corporation. A satellite system for search and rescue of lost or stranded vehicles could be developed by "using today's state-of-the-art," according to Dr. Fletcher. Credited with conceiving the idea for this system over a year ago, SEC believes that this system could be operating within some 12 to 18 months at a cost somewhere under $15 million.

Called SARUS, *S*earch *A*nd *R*escue *U*sing *S*atellites, the system would receive distress signals from astronauts, missile nose cones or conventional aircraft and ships and record these signals for later transmission to ground stations. By using the Doppler technique, a satellite within this system could measure the frequencies of the distress signals and determine the location of the sought vehicle in relation to the satellite. Then the satellite would record these Doppler findings on a tape which also records time signals. The tape would then be transmitted to the ground station where analysis of the Doppler findings would take place. The sought vehicle could be located within one-half mile and rescue could be accomplished in less than two hours.

Spokesmen for another electronics company, Radiation Incorporated, have expressed an interest in a commercial satellite communications system. "Industry has the capability for producing a communications relay satellite system," according to G. S. Shaw, Radiation Senior Vice President, who believes that "the launching vehicles, antenna systems, solar power source and electronic equipment are either in existence or could be developed from present state-of-the-art." In praising Dr. Glennan's statement offering NASA's assistance to private industry, Homer R. Denius, Radiation President, has said that Radiation is prepared "to participate in the development team for a commercial space communications network."

How many men contribute to a missile's final moments of life on earth? Thousands of military and industrial men share these brief moments of anxiety as a climax to days and months of effort. Multiple pieces of electronic equipment had to be built to fit numerous complex systems. Decisions had to be made. The launch of a missile is but the beginning of another cycle of new equipment, new systems, more decisions. One of the purposes of the AFCEA Convention is to bring into focus the present state of the art and the needs of the future.

15th AFCEA Convention • June 6, 7 and 8, 1961

Tuesday—Wednesday—Thursday • Washington, D. C.

Democratic Justice

(*Continued from page* 11)

warned, "Our dangers do not lie in too little tenderness to the accused. Our procedure has been always haunted by the ghost of the innocent man convicted. It is an unreal dream. What we need to fear is the archaic formalism and the watery sentiment that obstructs, delays and defeats the prosecution of crime."

Experience has clearly demonstrated that effective law enforcement work, swift trial and meaningful punishment, together with forceful publicity, are essential if we hope to at least make a start in freeing our streets from crimes of violence.

The story of criminals who have used the freedom granted them while awaiting court action to commit other vicious acts against society is all too familiar. The last FBI Agent to lay down his life in line of duty was ambushed and killed by a bloodthirsty hoodlum with a record of 24 years of criminal activity who was free on bond after having committed a vicious crime against his own 13-year-old daughter.

Confronted by the web of technicalities and delays which hampers the conscientious officer in the performance of his duties, it is no wonder that many law enforcement agencies feel they are on a treadmill. This hopeless situation is all the more prevalent when officers risk their lives to bring hardened offenders to justice only to have them unleashed on society again as beneficiaries of undeserved paroles, probationary terms and politically expedient pardons.

The humanitarian principles of parole and probation deserve our complete and unqualified endorsement. We sincerely believe in giving another chance to persons who have proved themselves worthy. But I submit to you that parole upon parole and probation upon probation for those who have not reformed are grossly unreasonable and unjustified.

It is shameful to bury the fine principles of parole and probation under a growing mountain of administrative blunders. The two basic requisites for an effective system are (1) careful selection of those offenders who are to be placed on parole or probation and (2) assurance of proper supervision. Yet, in community after community, we find inadequately staffed parole and probation offices. Under circumstances such as these, it is no wonder that supervision of parolees and probationers frequently becomes little more than a "tongue-in-cheek" expression.

The situation in some areas has become so extreme that it frankly is difficult to tell where softheartedness ends and softheadedness begins. Certainly this is true in those cases where courts, penal authorities and others responsible for the treatment of convicted felons close their eyes to the obvious danger sign before them. Witness, for example, the brutal murder of a 12-year-old boy last year by a gang of teen-age hoodlums. The fatal assault upon this youngster was absolutely unprovoked. Among his assailants was a vicious young probation violator 13 years old with a lengthy arrest record, whose release from custody had been vigorously protested by the local probation office because, as one official said, "We had seen . . . the pattern for murder that was forming, and we pleaded for the detention authorities to keep him."

No profession in our country has been so beset by outside theorists and pressure groups as law enforcement. This is true to such an extent today that we members of the law enforcement profession are well advised to be extremely skeptical of many alleged "friends." I refer particularly to those persons—some in an earnest desire for a remedy to the crime problem, and others blinded by the urge of "empire building"—who have advanced such potentially dangerous so-called "solutions" as Federal crime commissions, national clearinghouses and special prosecuting teams to cover the United States.

Typical of the ignorance of a self-appointed Pied Piper of crime is his statement that "Fingerprints, criminal records, and rogue's gallery photographs are the tools of a bygone era." Such statements reflect the total immaturity of a theoretician in the field of law enforcement. Remarks like these indict the maker for his stupidity.

The persons who endorse these grandiose schemes have lost sight of some very basic facts. America's compact network of state and local law enforcement agencies traditionally has been the nation's first line of defense against crime. Nothing could be more dangerous to our democratic ideals than the establishment of an all-powerful police agency on the Federal scene. The truth of these words is clearly demonstrated in the experience of nations ruled by ruthless tyrants both here in the Western Hemisphere and abroad.

As members of a profession dedicated to preserving America's God-given heritage of equality and justice for all, law enforcement has been subjected to relentless attacks by the communists, the hatemongers, the pseudoliberals and others who would destroy the very foundations of this great Republic. No one has less respect for our Constitution and Bill of Rights than the subversive elements who cloak themselves in every immunity and privilege which America's laws will allow.

During the past year, we have seen a mounting wave of optimism and confidence spread throughout the ranks of the Communist Party, USA. Defiance of the law and outspoken disrespect for authority dominate the words and deeds of these un-American conspirators. So brazen have the communists become that last spring they spearheaded mob demonstrations by students from schools of higher education against a Congressional Committee which was holding hearings in San Francisco.

In recent months, the communists have launched several ambitious programs designed to increase not only the Party's numerical strength but its influence over all phases of American life. Youth activities, labor disturbances, disarmament, and the recent national elections — these and many other matters of strategic national importance are presently receiving top priority attention of the Communist Party, USA. The views expressed by the communists regarding these issues coincide perfectly with those of the Kremlin. The Party in this country remains an inseparable arm of the treacherous atheistic international conspiracy being directed against the free world from Moscow.

In the fight against crime, communism, and hatemongers, we members of the American law enforcement profession have a sacred trust. We must not only preserve the high ideals of this great Republic for future generations. We must continue to demonstrate that the battle can be won without infringing in any way upon the freedoms which are so precious to us all. These freedoms —the very foundation of our society —are strengthened whenever law enforcement asserts itself as a bulwark not only against the criminal and the subversive but against any invasion upon the rights and dignity of the people.

We must not compromise the high ideals of our honored profession. During the past generation, law enforcement has made great strides forward. If we continue to move ever forward in the tradition of free men, the obstacles cannot long endure. By sheer force of dedicated service to this Republic and its people, victory ultimately will be assured.

AFCEA Sustaining and Group Members

Communications—Electronics—Photography

Listed below are the firms who are sustaining and group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Sustaining Members

American Telephone & Telegraph Co., Long Lines Department
Cook Electric Co.
General Electric Co., Defense Electronics Div.
International Telephone & Telegraph Corp.
New York Telephone Co.
Western Electric Co., Inc.

Group Members

Adler Electronics, Inc.
Admiral Corp.
Allied Control Co., Inc.
Allied Radio Corp.
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
American Radio Relay League, The
American Telephone & Telegraph Co.
Amphenol/Borg Electronics Corp.
Anaconda Wire & Cable Co.
Andrew Corp.
Ansco Division, General Aniline & Film Corp.
Arnold Engineering Co., The
Associated Electrical Industries Ltd.
Automatic Electric Co.
Automatic Electric Sales Corp.
Automatic Telephone & Electric Co. Ltd.
Autonetics, Division of North American Aviation, Inc.
Barry Controls Inc.
Bell Telephone Company of Pennsylvania, The
Bell Telephone Laboratories Inc.
Bendix Radio Division, The Bendix Corp.
Bendix Systems Division, The Bendix Corp.
Bliley Electric Co.
Bruno-New York Industries Corp.
Budd Electronics, Inc.
Burroughs Corp.
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Institute, Inc.
Carolina Telephone & Telegraph Co.
Central Technical Institute
Chesapeake & Potomac Tel. Co., The
Cincinnati & Suburban Bell Tel. Co., The
Collins Radio Co.
Columbia Broadcasting System, Inc.
Comptometer Corp.
Contraves Italiana S.p.A.
Convair/Pomona, Convair Division of General Dynamics Corp.
William C. Copp & Associates
Copperweld Steel Co.
Cornell-Dubilier Electric Corp.
A. C. Cossor Ltd.
Craig Systems, Inc.
Crosley Division, Avco Corp.
Decca Navigator Co. Ltd.
Delco Radio Division, General Motors Corp.
Designers For Industry, Inc.
Developmental Engineering Corp.
Diamond State Telephone Co., The
Dictaphone Corp.
DuKane Corp.
Du Mont, Allen B., Laboratories, Div. of Fairchild Camera & Instrument Corp.
Eastman Kodak Co.
Electronic Associates, Inc.
Electronic Communications, Inc.
Elgin Metalformers Corp.
Fairchild Camera & Instrument Corp.
General Analysis Corp.
General Telephone & Electronics Corp.
Gilfillan Bros. Inc.
Gray Manufacturing Co., The
Hallamore Electronics Co.
Hallicrafters Co., The
Haloid Xerox Inc.
Hazeltine Electronics Division, Hazeltine Corp.
Heinemann Electric Co.
Hoffman Electronics Corp., Military Products Div.
Hughes Aircraft Co.
Illinois Bell Telephone Co.
Indiana Bell Telephone Co., Inc.
Institute of Radio Engineers
Instruments for Industry, Inc.
International Business Machines Corp.
International Resistance Co.
International Standard Engineering, Inc.
Jansky & Bailey, Inc.
Jerrold Electronics Corp.
Kleinschmidt, Division of Smith-Coron Marchant Inc.
Leich Sales Corp.
Lenkurt Electric Co., Inc.
Litton Industries, Inc.
Lockheed Aircraft Corporation
Loral Electronics Corp.
Machlett Laboratories, Inc., The
Magnavox Co., The
Marconi's Wireless Telegraph Co. Ltd.
Martin Co., The
Materiel Telephonique, Le
McCoy Electronics Co.
Melpar, Inc.
Michigan Bell Telephone Co.
Montgomery Co., The
Motorola Inc.
Mountain States Telephone & Telegraph Co., The
Mullard Ltd.
Muter Co., Rola & Jensen Divisions
Mycalex Corporation of America
National Co., Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Co.
North Electric Co.
Northrop Corporation
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co., The
Pacific Telephone & Telegraph Co., The
Packard-Bell Electronics Corp.
Page Communications Engineers, Inc.
Paraplegics Manufacturing Co., Inc.
Phelps Dodge Copper Products Corp.
Philco Corp.
Photographic Society of America
Plessey Co. Ltd., The
Prodelin Inc.
Radiation Inc.
Radio Corporation of America
Radio Corporation of America, Astro-Electronic Products Div.
Radio Corporation of America, Defense Electronic Products
Radio Engineering Laboratories, Inc.
Radio Frequency Laboratories, Inc.
Raytheon Co.
RCA Great Britain Ltd.
Red Bank Division, The Bendix Corp.
Reeves Instrument Corp.
Republic Aviation Corp.
Rixon Electronics, Inc.
Rocke International Corp.
Ryan Aeronautical Co.
Saxonburg Ceramics, Inc.
Scanner Corporation of America, Inc.
Singer Manufacturing Co., The Military Products Division
Society of Motion Picture & Television Engineers
Southern Bell Telephone & Telegraph Co.
Southern New England Telephone Co., The
Southwestern Bell Telephone Co.
Sperry Gyroscope Co., Division of Sperry Rand Corp.
Sprague Electric Co.
Stackpole Carbon Co.
Standard Electronics Co.
Standard Telephones & Cables Ltd.
Stanford Research Institute
Stewart-Warner Electronics, Div. of Stewart-Warner Corp.
Stromberg-Carlson Co., Division of General Dynamics Corp.
Surprenant Mfg. Co.
Sylvania Electric Products Inc.
Technical Materiel Corp., The
Telectro Industries Corp.
Tele-Dynamics Div., American Bosch Arma Corp.
Telephonics Corp.
Teleprinter Corp.
Teletype Corp.
Texas Instruments Incorporated
T.M.C. (Canada) Ltd.
Tung-Sol Electric Inc.
Union Carbide Corp.
United Telephone Co. of Missouri
United Transformer Corp.
Varian Associates
Vitro Electronics, Division of Vitro Corporation of America
Waterman Products Co., Inc.
Webcor, Inc., Electronics Division
West Coast Telephone Co.
Western Union Telegraph Co., The
Westinghouse Electric Corp.
Westrex Corp., a Division of Litton Industries, Inc.
Wheelock Signals, Inc.
Wilcox Electric Co., Inc.
Wisconsin Telephone Co.
Wollensak Optical Co.
Zenith Radio Corp.

Association affairs

NATIONAL OFFICERS

President
Benjamin H. Oliver, Jr.*

1st Vice President
Maj. Gen. Harold W. Grant, USAF*

2nd Vice President
Maj. Gen. R. T. Nelson, USA*

3rd Vice President
Rear Adm. Frank Virden, USN*

4th Vice President
Frank Stoner*

5th Vice President
Walter H. Pagenkopf*

General Manager
W. J. Baird

Secretary
F. T. Ostenberg

General Counsel
Frank W. Wozencraft

Treasurer
W. Earl Trantham

PERMANENT DIRECTORS

George W. Bailey
Percy G. Black
Frederick R. Furth*†
Theodore S. Gary
William J. Halligan
Frederick R. Lack
Joseph R. Redman
David Sarnoff
W. Walter Watts

DIRECTORS

1961	1962	1963	1964
Harry E. Austin	Theodore L. Bartlett	Leonard D. Callahan	Francis L. Ankenbrandt
George I. Back	Maj. Gen. Gordon A. Blake, USAF	A. F. Cassevant	W. Preston Corderman
Roland C. Davies	Ben S. Gilmer*	Walter C. Hasselhorn	E. U. DaParma
E. K. Foster	Joseph E. Heinrich	Walter P. Marshall	George L. Haller
Francis H. Lanahan	John R. Howland*	Henry J. McDonald	Charles F. Horne
Paul S. Mirabito	Fred E. Moran	A. L. Pachynski	David R. Hull
Peter Schenk	Donald C. Power	William L. Roberts	John W. Inwood
Robert C. Sprague	Stephen H. Simpson	Ellery W. Stone	Walter K. MacAdam

**Executive Committee Member. †Immediate Past President.*

AFCEA CHAPTER ORGANIZATION

REGIONAL VICE PRESIDENTS AND CHAPTER OFFICERS

REGION A

G. D. Montgomery, AT&T Co., 32 Ave. of the Americas, New York, N. Y. ***New England States, New York, New Jersey.***

BOSTON: Pres.—Louis J. Dunham, Jr., Franklin Technical Institute, 41 Berkely St., Boston, Mass. Sec.—William Melanson, Cambridge Thermionics Corp., 447 Concord Ave., Cambridge.

FORT MONMOUTH: Pres.—Dr. Hans K. Ziegler, 213 Perrine Ave., Elberon, N. J. Sec.—Maj. Melvin F. Werksman, USAR, 7 Bauer Ave., Elberon, N. J.

LEXINGTON-CONCORD: Pres.—Lt. Col. D. V. Mayer, USAF, AMC Electronics System Center, L. G. Hanscom Field, Bedford, Mass. Sec.—1/Lt. J. Burkley, USAF, AMC Electronics System Center, L. G. Hanscom Field, Bedford, Mass.

NEW YORK: Pres.—Henry R. Bang, New York Tel. Co., 140 West St., N. Y. 7, N. Y. Sec.—Thomas Brown IV, New York Tel. Co., Rm. 2011, 140 West St.

NORTHEASTERN UNIVERSITY: 360 Huntington Ave., Boston 15, Mass. Div. A: Pres.—Albert V. Short; Div. B: Pres.—Harry Giberson.

ROME-UTICA: Pres.—Lt. Col. M. Bobela, Hq. GEEIA, Box 123, Griffiss AFB, N. Y. Sec.—L. P. Chemlen, P.O. Box 247, Rome, N. Y.

SOUTHERN CONNECTICUT: Pres.—John N. Higgins, KIP Electronics Corp., 29 Holly Pl., Stamford, Conn. Sec.—J. A. Leopold, Dictaphone Corp., 375 Howard Ave., Bridgeport.

SYRACUSE: Pres.—Colin W. Getz, New York Telephone Co., 108 West Fayette St., Syracuse, N. Y. Sec.—John G. Labedz, Lyndon Road, Fayetteville, N. Y.

REGION B1

George C. Ruehl, Jr., Electronic Aids, Inc., 2118 St. Paul Street, Baltimore, Md. ***Delaware, District of Columbia, Maryland, Eastern Pennsylvania and Virginia.***

BALTIMORE: Pres. — Cdr. Bob Kirsten, USCG, U. S. Coast Guard Yard, Curtis Bay, Baltimore 26, Md. Sec.—Thomas E. Thompson, Jr., The Martin Company.

PHILADELPHIA: Pres.—Robert G. Swift, Bell Tel. Co. of Pa., 121 N. Broad St., Phila., Pa. Sec.—T. D. Callahan, Jr., Bell Tel. Co. of Pa., 1835 Arch St., Phila., Pa.

WASHINGTON: Pres.—K. B. Lewis, Eastman Kodak Co., 1000 Conn. Ave., Wash. 6, D. C. Sec.—H. A. Crossland, General Electric Co., 777 14th St., Wash. 5, D. C.

REGION B2

Paul H. Clark, Radio Corporation of America, 224 N. Wilkinson St., Dayton, Ohio. ***Kentucky, Ohio, West Virginia and Western Pennsylvania.***

CINCINNATI: Pres.—Ralph G. Edwards, American Tel. & Tel. Co., 1014 Vine St., Cincinnati 2, Ohio. Sec.—Henry Lemeur, 1329 Arlington St.

DAYTON-WRIGHT: Pres.—Col. Robert L. Salzarulo, USAF, 1148 Cloverfield Ave., Dayton, Ohio. Sec.—K. C. McClellan, 1st & Ludlow Sts., Talbott Bldg., Rm. 256, Dayton 2, Ohio.

LEXINGTON: Pres.—Maj. K. J. Holmes, Lexington Signal Depot, Lexington, Ky. Sec.—E. W. Galins, 201 Roman Rd.

PITTSBURGH: Pres.—R. H. Creps, Bell Tel. Co., 201 Stanwix St., Pgh. 22, Pa. Sec.—H. W. Shepard, Jr., 625 Stanwix St., Pgh.

REGION C

W. K. Mosley, Southern Bell T&T Co., Hurt Bldg., Atlanta, Ga. ***Southeastern States along Atlantic and Gulf coasts — from North Carolina to Louisiana including Tennessee.***

ATLANTA: Pres.— J. S. Seigle, Southern Tel. & Tel. Co., 805 Peachtree St., N. E., Atlanta, Ga. Sec.—M. S. Butler, P. O. Box 685, Atlanta Airport, Atlanta 20, Ga.

AUGUSTA-FORT GORDON: Pres.—Francis A. Saxon, Georgia Power & Light Co., 713 Broad St., Augusta, Ga. Sec.—Orian Niehuss, So. Bell Tel. Co., 937 Greene St.

CAPE CANAVERAL: Pres.—Lt. Col. J. W. Kelly, USAF, 90 S. Poinciana Dr., Eau Gallie, Fla. Sec.—H. F. Blackwood, P. O. Box 1046, Eau Gallie, Fla.

CENTRAL FLORIDA: Sec.—Russell R. Randell, 208 So. Manhattan Ave., Tampa, Fla.

GULF COAST: Pres.—Lt. Col. George S. Walborn, 174 St. Andrews FWY, Biloxi, Miss. Sec.—Leland E. Kelly, 104 45th St., Gulfport, Miss.

LOUISIANA: Pres.—J. C. Morris, 206 Gibson Hall, Tulane U., 6823 St. Charles Ave., New Orleans 18. Sec.—W. J. de Armas, Jr., Southern Bell Tel. & Tel. Co., 520 Barronne St., New Orleans 13.

MONTGOMERY: Pres.—Lt. Col. Herbert Herman, Air Command & Staff College, Maxwell AFB, Ala. Sec.—Luther L. Hall, 3549 Cloverdale Rd., Montgomery, Ala.

NORTH CAROLINA: Pres:—J. F. Havens, Carolina Tel. and Tel. Co., Tarboro, N. C. Sec.—John C. Coley, Carolina Tel. and Tel. Co., 517 Hay Street, Fayetteville, N. C.

NORTHWEST FLORIDA: Pres.—Maj. Ray Kinslow, USAF, Air Proving Ground Center, 3201st ABW, Eglin Air Force Base, Fla. Sec.—Capt. Roy L. Stover, 4751st ABRON, Box 491, Eglin AF Aux. Fld. #9.

ORANGE: Pres.—Lt. Col. D. Dobbins, USAF (Ret.). Sec.—J. A. Trutter, 1013 Ensenada Dr., Orlando.

SOUTH CAROLINA: Pres.—H. L. Lackey, Southern Bell Tel. & Tel. Co., Columbia, S. C. Sec.—Donald D. Harris, Southern Bell T&T Co., Owen Bldg., Columbia, S. C.

REGION D

Maj. Gen. Harry Reichelderfer, USA (Ret.), Southwest Research Institute, 8500 Culebra Rd., San Antonio, Tex. ***New Mexico, Texas, Oklahoma, Arkansas.***

LAWTON-FORT SILL: Pres.—Col. R. Laskowsky, U. S. Army Artillery & Missile School, Fort Sill, Okla. Sec.—C. E. Warner, 208 N. 31st St., Lawton, Okla.

NORTH TEXAS: Pres.—R. T. Shiels, Anaconda Wire & Cable Co., 1201 Fidelity Union Life Bldg., Dallas 1. Sec.—Robert J. Novak, AT&T Co., 212 No. St. Paul St., Dallas.

SOUTH TEXAS: Pres.—Col. H. H. Moreland, USAF, 1725 Chennault St., San Antonio, Tex. Sec.—John D. Rainbolt, Southwestern Bell Tel. Co., 301 Broadway.

TINKER-OKLAHOMA CITY: Pres.—R. E. Howard, Southwestern Bell Tel. Co., 405 N. Broadway, Oklahoma City, Okla. Sec.—G. Billy, 3406 Bella Vista, Midwest City, Okla.

WHITE SANDS MISSILE RANGE: Pres.—Maj. M. S. Arbogast, SigC., 217 Rossford Ave., White Sands Missile Range, N. M. Sec.—M. E. Brady, 4939 Blue Ridge Circle, El Paso, Texas.

REGION E

Walter H. Pagenkopf, Teletype Corp., 5555 Touhy Ave., Skokie, Ill. ***Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Colorado.***

CHICAGO: Pres.—William L. McGuire, Automatic Electric Co., Box 35, Northlake, Ill. Sec.—Sanford Levey, 1303 Lincoln Ave. So., Highland Park, Ill.

DECATUR: Pres.—Capt. Frank Matz, 505 Nelson Blvd., Decatur, Ill. Sec.—David Honn, 659 W. William St., Decatur. Ill.

GREATER DETROIT: Pres.—Col. J. I. Vanderhoof, 1921 Brock Court, Ann Arbor, Mich. Sec.—J. R. Saxton, Michigan Bell Telephone Co., 1109 Washington Blvd. Bldg., Detroit.

KANSAS CITY: Pres.—Lt. Col. G. D. Meserve, USAF(Ret.), 6211 West 55th St., Mission, Kansas. Sec.—R. P. Baker, Southwestern Bell Tel. Co., 6500 Troost, Kansas City, Missouri.

ROCKY MOUNTAIN: Pres.—Col. L. C. Heartz, 2301 Clarkson Dr., Colorado Springs, Colo. Sec.—Maj. H. W. Beaver, USAF (Ret.), 1936 Downing Dr., Colorado Springs.

SCOTT-ST. LOUIS: Pres.—Col. David W. Baugher, MOANG, No. 1 Grant Road, St. Louis 23, Mo. Sec.—Allan L. Eisenmayer, P.O. Box 456, Trenton, Ill.

REGION F

Lt. Cdr. Ray E. Meyers, USN (Ret.), Consultant, Engleman and Company, Inc., 717 Anderson Way, San Gabriel, Calif. ***Arizona, Utah, Nevada, California, Idaho, Oregon, Montana and Washington.***

ARIZONA: Pres.—Maj. C. D. Harding, 101A Henry Circle, Ft. Huachuca. Sec.—G. P. Walther, P. O. Box 4152, Huachuca City.

GREATER LOS ANGELES: Pres.—John W. Atwood, Hughes Aircraft Co., Culver City, Calif. Sec.—Joseph H. Goodrich, Pacific Tel. & Tel. Co., 737 S. Flower St., Los Angeles 17, Calif.

SACRAMENTO: Sec.—Capt. Robert McMorrow, 951 La Sierra Drive.

SAN DIEGO: Pres.—Capt. John H. Allen, USN, Navy Electronics Lab., San Diego 52, Cal. Sec.—Paul Vasquez, 9445 Doheny Rd., Santee, Calif.

SAN FRANCISCO: Pres.—H. L. Schnoor, Pacific Tel. & Tel. Co., 140 New Montgomery St., San Francisco 5, Cal. Sec.—H. W. Weddell, Rm. 117, Bldg. 35, Presidio of San Francisco, Calif.

SANTA BARBARA: Pres.—RAdm. Clarence C. Ray, 63 Manzanita Lane, Star Route, Santa Barbara, Cal. Sec.—Walter W. Montgomery, Raytheon Co., P.O. Box 636.

SEATTLE: Pres.—R. Pace, Pacific Tel. & Tel. Co., 1200 3rd Ave., Seattle 1, Wash. Sec.—W. E. Cruse, 4001 W. Concord St.

CHAPTERS AT LARGE

FRANKFURT: Pres.—Ralph L. Prokop, USA Procurement Center, APO 757, N. Y.

HAWAII: Pres.—Col. W. A. Simpson, USA, Signal Office, Hq. USARPAC, APO 958, San Francisco, Calif. Sec.—Lt. Col. G. A. Kurkjian, USA (same address).

KOREAN: Sec.—William L. Wardell, OEC, RD-CD, APO 301, S. F.

LONDON: Pres.—Lt. Col. W. H. Fritz, MAAG-UK, Box 28, FPO, NY, NY. Sec.—Lt. Col. S. B. Hunt, CINCNELM Staff, Box 6, FPO, NY, NY.

MARIANAS: Pres.—Lt. Col. W. E. Bullard, USAF, 1958th AACS Sq., MATS, APO 334, San Francisco, Calif. Sec.—Maj. F. A. Wall (same address).

OKINAWA: Pres.—Lt. Col. Russell Marks, 313th Air Division, APO 239, San Francisco, Calif. Sec.—Thomas G. Byrd, Jr., Hqs. U.S. Army Signal Group, RYIS APO 331, San Francisco.

PARIS: Pres.—Maj. Gen. Frank W. Moorman, Signal Div., SHAPE, APO 55, N. Y., N. Y. Sec.—Maj. John E. Mills, 7th Signal Battalion, SHAPE, APO 55, NY., N.Y.

PHILIPPINE: Pres.—Lt. Col. M. A. Vargas, USAFR, Hq. 13th Air Force, APO 74, San Francisco, Calif. Sec.—CWO-2 Robert L. Cloud, 1961st AACS Gp., Box 496, APO 74, San Francisco.

SAN JUAN: Pres.—Clyde Dickey, Porto Rico Telephone Co., P. O. Box 4275, San Juan, P. R. Sec.—Albert R. Crumley, Jr., Crumley Radio Corp., Box 10073, Caparra Heights, San Juan.

SWITZERLAND: Pres.—Capt. Gerald C. Gross, USNR, Intl. Telecommunications Union, Geneva. Sec.—Robert V. Lindsey, Intl. Telecommunications Union, Geneva.

TOKYO: Pres.—H. F. Van Zant, Standard Electric Corp., Box 49, Shiba P.O., Tokyo, Japan. Sec.—P. W. Becker, Hq. U. S. Army Sig. Comm. Agency, APO 343, San Francisco, Calif.

Chapter News

REGION A

Boston

The initial meeting of the season was held at the Air Force's Hanscom Field, Bedford, Mass., in September. The meeting was highlighted by descriptions of military installations in New England as well as a technical presentation by Michael Yurko, coordinating engineer for Technical Materiel Corporation, Mamaroneck, N. Y. His subject was "Conservation of the High Frequency Spectrum through Utilization of Upgraded Communications Systems and Equipment."

Boston—Among those attending the initial meeting of the chapter were: (front row, L to R) A. A. Morrissette, deputy regional director, Region I, Office of Civil and Defense Mobilization; Col. W. A. Bennett, director of procurement, Electronic Systems Command, AMC, Hanscom AFB; Capt. F. W. Brooks, plans officer, First Naval District; L. Dunham, AFCEA chapter president; Col. G. C. Willcox, Jr., Hanscom Field base commander; (back row, L to R) M. Yurko, guest speaker; Capt. W. D. Shields, chief of staff, First Coast Guard District; G. D. Montgomery, AFCEA regional vice president; Col. W. K. Kincaid, chief of staff, Air Force Command and Control Development Division, Hanscom Field; Col. R. Claffee, commanding officer, Massachusetts Sector, Thirteenth Army Corps, Ft. Devens, Mass.

Fort Monmouth

Dr. Paul A. Siple, explorer and military geographer, addressed 250 members and guests who attended the October 20 dinner held at Gibbs Hall Officers Club. He told the story of Antarctica from the pioneering days of Admiral Richard E. Byrd's first expedition to Little America to the modern-day research of the recent IGY.

Dr. Siple, now scientific advisor, Office of the Chief of Army Research and Development, Washington, made his first trip to Antarctica with Admiral Byrd as a 19-year-old

Eagle Scout and has made six trips since. He and seventeen pioneering companions were the first human beings ever to winter at the very bottom of the world. His latest book, "90 Degrees South," is the story of the building of the American Base at the South Pole.

His travels and research have not been entirely confined to polar areas. For a period he directed the Army's basic research programs and has done extensive research in the fields of climatology, climatic factors controlling building, design and the development of clothing and protection devices for which he holds a number of patents.

In 1957 he returned from having served as the Station Scientific Leader at the IGY Geographic South Pole Station. The scientific program was carried out despite temperatures that went to a record low of —102.1 degrees Fahrenheit.

Dr. Siple was introduced by chapter president, Dr. Hans K. Ziegler, chief scientist at the U. S. Army Signal Research and Development Laboratory.

Fort Monmouth—At the October 20 meeting: (L to R) Maj. Gen. William D. Hamlin, Fort Monmouth Commander; guest speaker Dr. Paul A. Siple, scientific advisor, Office of Chief of Army Research and Development, Washington; Dr. Hans K. Ziegler, Fort Monmouth chief scientist; Amory Waite. Dr. Siple and Mr. Waite are both veterans of Antarctic expeditions.

New York

Chapter president, Henry R. Bang introduced guest speaker B. G. Anderson at the opening meeting of the Fall season on September 28 at the Hotel Belmont Plaza. Mr. Anderson is manager, Federal Government Sales, Electronic Data Process Division, Radio Corporation of America, Washington, D. C.

He described the applications and increasing interest for electronic data processing in our modern world of business and government. He indicated that the greatest popularity is for the digital type computer in large scale applications, with analog computers being used for more special and complex services. He said that there are over 1000 major electronic data processing systems established in our country with uncountable numbers of smaller complexes now installed. Rapidly reaching numbers will make the data processing industry a major electronics influence in the next few years.

New York—B. G. Anderson, manager, Federal Government Sales, Electronic Data Process Division, Radio Corporation of America, Washington, D. C., guest speaker at the September 28 meeting.

At the October 26 meeting Headquarters, U. S. Air Force staged a White Express Alert. This Alert was part of a program given by Colonel Joseph E. Hannah, chief of the Systems Division, U. S. Air Force, who was selected by Major General Harold W. Grant, USAF, Director Communications—Electronics, to present a talk on "Trends in Air Force Communications." The White Express Alert demonstrated the global communications system which makes it possible for Air Force Headquarters in the Pentagon to reach all of their Commanders throughout the world.

The chapter Christmas Party will be December 14, at the New York Naval Shipyard.

Rome-Utica

The second 1960-61 meeting was held October 18 at Trinkaus Manor. Following dinner a film on TIROS (Television, Infrared, and Observation Satellite) was shown by representatives of Radio Corporation of America.

REGION B1

Washington

Over 500 members and guests attended the November 3 luncheon meeting held at the Grand Ballroom of the Willard Hotel. Guest speaker was Dr. Eberhardt Rechtin, chief, Telecommunications Division, Jet Propulsion Laboratory, NASA.

Dr. Rechtin's subject was "What's the Use of Our Racing for Space?" He discussed the various elements of the space race, including a comparison of the probable objectives of the Russians as related to the objectives of the U. S.

REGION B2

Cincinnati

The first meeting after summer vacation was held October 19 at the Cincinnati Club. Following dinner and a short business meeting Dr. E. A. Steinhoff, Avco Corporation, spoke to 27 members and guests of the chapter on "Electronics in Space."

Dr. Steinhoff is a well known speaker who has gained an international reputation as an authority on space problems beginning with his early association with Dr. Wernher Von Braun at the Peenemunde Rocket Research Center. He is currently Staff Scientific Advisor at Avco Corporation. Dr. Steinhoff has served with both the Army and the Air Force in connection with their space and missile activities. His talk, which was illustrated by slides, dealt broadly with problems in guidance and instrumentation of space vehicles and satellites.

Dayton-Wright—Pictured at the October 27 meeting are: (standing, L to R) L. R. Koepnick; Col. Robert L. Salzarulo, chapter president; Paul Clark; Lt. Col. Scotty Shambeck, executive officer, ASC; Col. James E. Davoli, Washington, D. C.; Allan F. Schmahl, chapter executive vice president and chairman of the meeting; Col. L. M. Bivins, ASC; (seated, L to R) Mrs. Allan F. Schmahl; Col. John A. O'Leary, Hq AMC; Mrs. Robert L. Salzarulo; Maj. Gen. W. A. Davis; Mrs. Paul Clark.

Dayton-Wright

The September 15 meeting was held at the Officers Club, Wright-Patterson Air Force Base, Ohio. The joint meeting

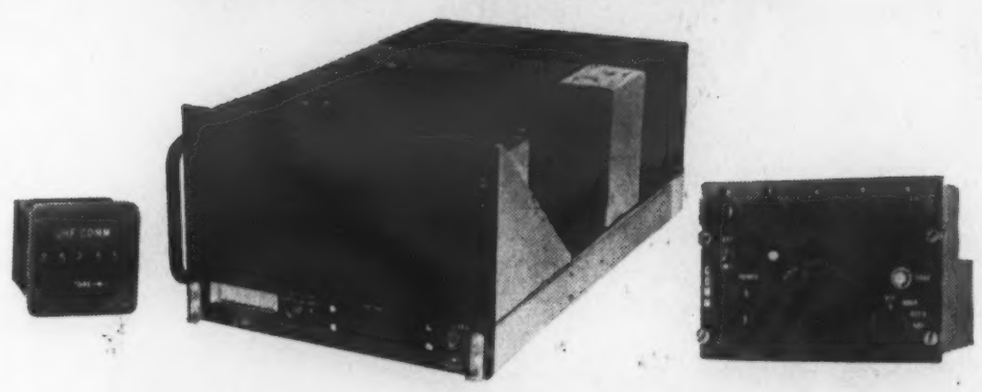
(*Continued on page* 50)

Magnavox continues to maintain a position of leadership in the airborne communications field.

Magnavox engineering, in conjunction with the Air Force, has developed an advanced airborne communication system that is designed to meet the requirements of the future. Utilizing wide band techniques, such functions as television relay for bomb damage assessment, data link for control and identification, and many other forms of air-to-air and air-to-ground communications can all be realized over the same equipment as used for voice.

Magnavox

AN/ARC-50 SYSTEM



COMMUNICATIONS | RADAR | ● DATA HANDLING | ASW | MISSILES

THE MAGNAVOX CO. • DEPT. 315 • *Government and Industrial Division* **• FORT WAYNE, IND.**

was held in conjunction with the Professional Group, Military Electronics of the IRE.

Guest speaker at the meeting was Henry Viscardi, who heads Abilities, Incorporated, a New York firm that employs over 400 workers, all disabled. The firm grosses over $1.5 million a year and all profits are put back into the company to enable employment of still more disabled persons, according to Mr. Viscardi.

Pittsburgh

The first luncheon meeting of the season was held at the Roosevelt Hotel, Civic Room, October 25. The chapter was fortunate to preview a new 25 minute color film "Seconds for Survival" which is a presentation of the Bell Telephone Company.

REGION C

Atlanta—Col. John E. Morrison, Jr., (seated, left) guest speaker at the August 3 meeting. Others pictured: John S. Seigle, (seated, right) chapter president; (standing, L to R) Mel Butler, secretary-treasurer; Gerald H. Ghertner, W. L. Mollands, Lt. Col. Marvin A. Walker, chapter vice presidents.

Augusta-Fort Gordon

The use of communications in air defense was the topic of the September 15 meeting held at Buck Lodge, Mirror Lake, on the Fort Gordon post.

Captain Egbert Buckout, chief of the Missile Monitor Repair Course at the U. S. Army Southeastern Signal School gave an illustrated talk. He explained how the search radar makes contact with an object in the sky, then transmits information on the route and speeds it to the missile pad. He further explained how the missile tracks and strikes its target.

At the October 20 meeting, also held at Buck Lodge, representatives of the Hughes Aircraft Corporation addressed the chapter. Richard E. Tuck, head of the Defense Systems Section, and William H. Walters, manager of space technology in the Defense Systems Department, spoke on the topic "Applying Fixed Array Radar Techniques to Defense Systems."

Augusta-Fort Gordon— Francis A. Saxon, (left) chapter president, welcomes R. E. Tuck, head of Defense Systems Section of Hughes Aircraft Corp., principal speaker at the October 20 meeting.

Cape Canaveral

The regular meeting of the chapter was held September 29 at the Officers Club, Patrick Air Force Base. Captain C. W. Goldey, vice president, presided in the absence of Lieutenant Colonel James W. Kelly. Twenty-five members and guests attended the meeting.

A meeting was also held October 27. The program was a film on Project Echo narrated by a speaker from the Bell Telephone Laboratories.

Gulf Coast

The speaker for the October 10 meeting was Les Buckland of Eastman Kodak. The dinner meeting was held at the Buena Vista Hotel, Biloxi, Mississippi, with 120 members and guests attending.

Mr. Buckland presented a slide demonstration on picture taking entitled "Color with Confidence." His tips for improving color photography were to get closer, include foreground and scenic pictures, and avoid distracting shadows. He emphasized taking more pictures so you would be sure to get some good pictures. He also suggested showing slides in a logical story-telling order.

The November 7 meeting featured a talk by Major Thomas Capraro, Air University, on "Closed Circuit TV as an Educational Medium."

Montgomery—Pictured at the September meeting: (L to R) J. B. Sconyers, repair foreman, Southern Bell Telephone Company; George W. Hails, transmission supervisor, American Tel and Tel. Company; Lt. Col. Herbert Herman, USAF, chapter president. Mr. Sconyers and Mr. Hails presented the Bell system film about communication satellites, "The Big Bounce."

Orange

The October meeting of the chapter was held at Rio Pinar Country Club, Orlando. The Bell Telephone Company's film "The Big Bounce" was shown by Lewis A. Brown, Jr., past president of the chapter.

Following the film, election of officers for the 1961 term was held. Those elected were: president, Donald Dobbins (Lt. Col., USAF, Ret.) Hammond Electronics; 1st vice president, Vince Meder, Radiation; 2nd vice president, Ted Duay, Johnson Electronics; 3rd vice president, Wayne Jones (Col., USAF, Ret.); 4th vice president, Don Phelps, Pearce-Simpson Company; secretary, James A. Trutter (Lt. Col., USAF, Ret.) New York Life Insurance Company; treasurer, H. Ray Weaver, Minute Maid.

The board of directors includes Ted Duay, W. S. Minnich, Don Phelps, Colonel Wayne Jones, Philip Cole and three immediate past presidents, Fred Cullman, Eugene Johnson and Lewis A. Brown, Jr. W. S. Minnich was appointed membership chairman.

The October 25 meeting, held at Rio Pinar Country Club, featured a talk by Dr. Elfers, space scientist, The Martin Company, Orlando, Florida.

REGION D

South Texas

At the October 19 dinner meeting, held at Brooks Air Force Base Officers Club, 103 members and guests heard Joseph J. Farley of International Business Machine Corp. speak on "Electronic Data Processing."

(*Continued on page* 52)

Breaks message center bottlenecks

...simultaneously receives, relays and numbers tapes- automatically

This Kleinschmidt Torn Tape Relay Unit ends military communications traffic jams. It prints and perforates each incoming message and automatically numbers all messages to be relayed to one or one hundred receivers in the network.

Fast. Accurate. Efficient. Kleinschmidt's complete line of fine equipment, switching centers and systems are in U. S. Military use throughout the world. *Contact us to arrange for a discussion with our equipment and systems engineers.*

SCM KLEINSCHMIDT
DIVISION OF SMITH-CORONA MARCHANT INC.

Lake-Cook Road, Deerfield, Illinois · Telephone Windsor 5-1000

He gave an introduction to electronic data processing, IBM tele-processing, Sabre (the IBM seat reservation system used by American Airlines), North American Aviation's micro-wave tele-processing link, the Air Force logistics communication system, and a glimpse at future applications.

Chan P. Thomas of Los Angeles was guest speaker at the November 15 meeting. His talk, "The Day the Earth Tumbled," explained strange changes in climates, ocean currents, and the ice cap.

REGION E

Chicago—Members of the chapter with host Robert F. Halligan, vice president, Hallicrafters Co., at the September 29 dinner meeting. Pictured are: (L to R) Walter H. Flinn, chapter vice president, general security manager, Illinois Bell Telephone Co.; Carrington H. Stone, chapter vice president, Carrington H. Stone Engineers and Exporters; Dr. Robert E. Beam, vice president, research and development, Hallicrafters Co., speaker for the evening; Walter H. Pagenkopf, AFCEA regional vice president, vice president-manufacture, Teletype Corp.; Mr. Halligan; William L. McGuire, chapter president, vice president and general commercial manager, Automatic Electric Co.; Arthur J. Schmitt, chapter vice president, president, Amphenol-Borg Electronic Corp.; Sanford H. Levy, chapter secretary-treasurer, commercial sales manager, Allied Radio Corp.

Decatur

Arrangements were made for members and guests of the chapter to tour television station WTVP on October 25. Because of the tour there was no business meeting.

Scott-St. Louis

Guest speaker at the November 4 meeting was Colonel Francis K. Morgan, USAF, Director C-E, Headquarters TAC. His subject was "Communications-Electronics Support for the Mission of TAC." The dinner meeting was held at Augustines Restaurant.

The Ninth Anniversary meeting, held December 2, featured a special program of dinner and dancing. Honored guests were Major General F. L. Ankenbrandt, USAF (Ret.) and Benjamin H. Oliver, AFCEA national president.

Rocky Mountain—Outgoing president Col. Howard S. Gee, Air Defense Command (left) hands the gavel of office to new president Col. Leslie C. Heartz, Air Defense Command (right). Other new officers are: (L to R) publicity vice president James F. Edwards, Mountain States Telephone; membership vice president Maj. Sherman R. Cummings, ADC; program vice president Lawrence F. McAdams, ADC; treasurer Marion F. Sanders, ADC; secretary Howard W. Beaver, ADC.

REGION F

Greater Los Angeles

Chapter president John W. Atwood welcomed 78 members and guests attending the opening meeting of the 1960-61 year held October 5, at the West Garden Room, Statler Hotel. Guest speaker of the evening was Vice Admiral William V. Davis, Jr., USN (Ret.), who was introduced by Ray E. Meyers, chapter program chairman.

Greater Los Angeles—Guest speaker Vice Admiral William V. Davis, Jr., USN (Ret.) addresses the chapter at the October 5 meeting.

Admiral Davis spoke of the determined conspiracy of the communists to completely and absolutely dominate the world. Peace to them means one thing, he said, cessation of everything but the communistic world. He said the Navy's part in this is attested to in its many accomplishments in evacuating American Nationals from troubled spots, helping in disaster areas, keeping the shipping lanes open and protecting the movement of goods and supplies. Navy patrol zones provide the coordination necessary to our defense in cooperation with SAC and ADC. He made an appeal to electronics people to work on a method providing for absolute detection of the modern submarine.

San Diego

Dr. Waldo K. Lyon, Navy Electronics Laboratory, noted sea-ice physicist and Arctic explorer, spoke to 65 members and guests of the chapter at the first fall meeting at the Town and Country Club, Mission Valley. Dr. Lyon described the adventures that he, Arthur Roshon (also of the Navy Electronics Laboratory) and other scientists and crewmen went through on the historic voyage of USS SEADRAGON across the top of the world last summer. He told of the objectives and problems on such under-ice cruises.

Captain John H. Allen, USN, new chapter president, also introduced Leon Parma, administrative aide to Congressman Robert Wilson, for a brief talk on the Congressman's plans to bring a Science Information Center to San Diego.

Other new officers of the chapter are: 1st vice president, George A. Pearson, Rohr Aircraft; 2nd vice president, William R. Rauth, Convair San Diego; secretary, Paul Vasques, Convair San Diego; treasurer, Charles M. Hatcher, Navy Electronic Laboratory.

The November 15 meeting was held at San Diego's Golden Lion International Restaurant. William G. Alexander, new president of Trans-Data Corporation was guest speaker. He and a panel of industrial and science information experts discussed "Problems of Acquiring and Transmitting Technical Information."

CHAPTERS AT LARGE

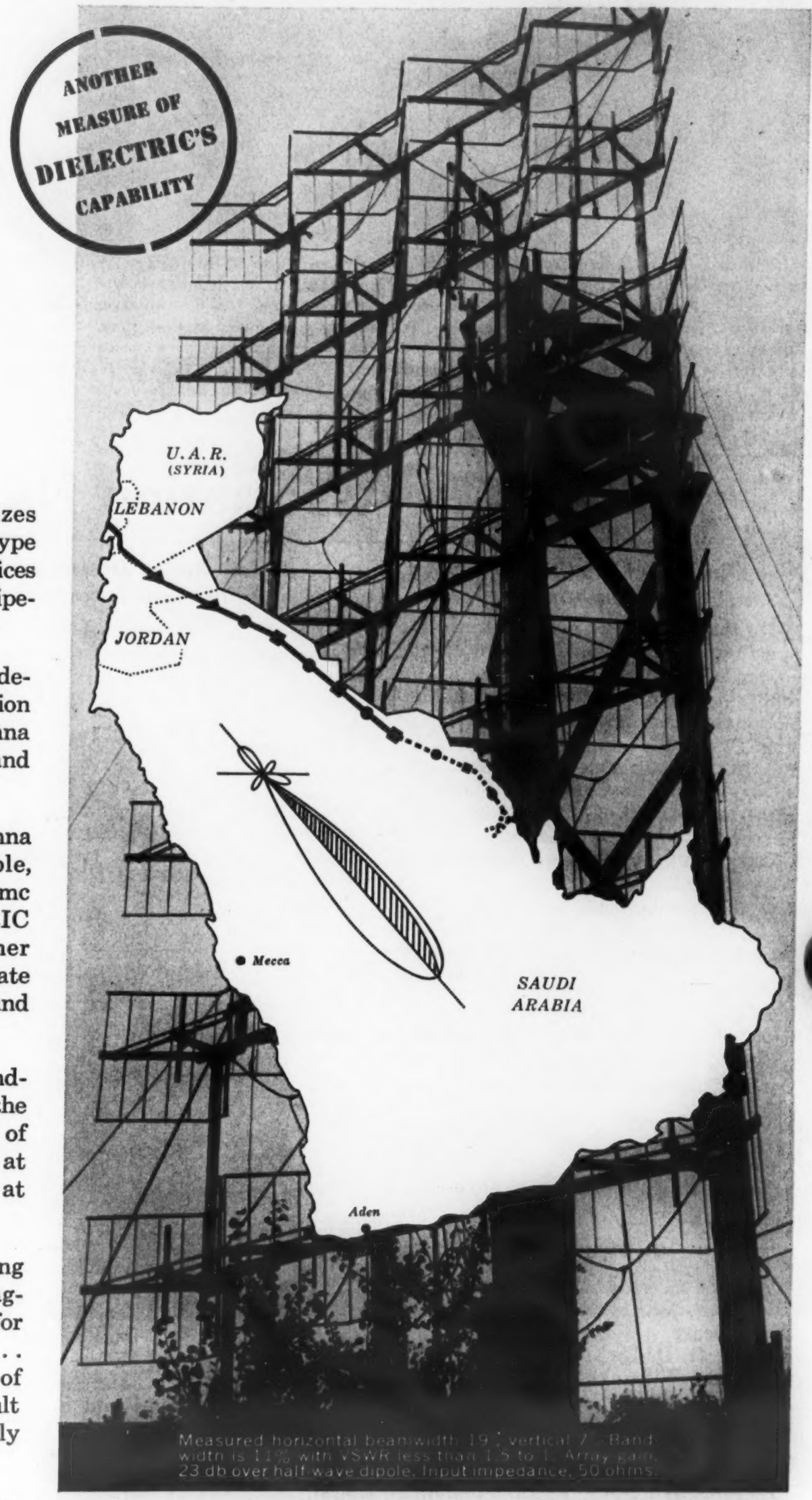
Marianas

An organizational meeting was held on October 11 at the Andersen Air Force Base Officers Club. Present were professional communications and electronics personnel representing the 1958th AACS Sq., 3rd Air Div., 27th Comm. from Andersen, Federal Aviation Agency, Naval Communication Station, Radio Corporation of America, General Electric and KUAM Radio and TV.

The following temporary officers were elected at the meeting: president, Lieutenant Colonel W. E. Bullard, USAF; 1st vice president, Commander J. L. Gates, USN; 2nd vice president, J. D. Driver, RCA; 3rd vice president, L. V. Richmond, FAA; secretary, Major F. A. Wall, USAF; treasurer, R. F. Gassner, USAF/Philco.

(*Continued on page* 54)

CONTROLLING TRANS ARABIAN'S PIPELINE VIA HIGH DIRECTIVITY VHF ARRAYS



Trans-Arabian Pipeline Company utilizes point-to-point multi-channel voice, teletype and mobile communications between its offices in Beirut, Lebanon and units along its pipeline from Saudi Arabia.

DIELECTRIC'S ASSIGNMENT: — to design and develop, for a substantial extension of this system, high directivity VHF antenna arrays for multi-channel communications and automated pipeline control.

To meet the requirement for an antenna system that would provide dependable, over-the-horizon communications at 160 mc . . . power, 250 watts . . . DIELECTRIC built five arrays (each with 32 corner reflectors), and complete with "corporate structure" feed system plus supporting and mounting hardware.

Also required was a network of coaxial band-pass filters for duplexing, tunable over the useful frequency range of the antenna. All of the elements had to be carefully adjusted at the factory and ready for installation at the site.

The design, development and complete testing of these arrays — plus disassembly, packaging and shipment to the site . . . ready for installation with minimum adjustments . . . in record time . . . is a significant measure of DIELECTRIC'S capability to solve difficult problems in communications, resourcefully and dependably.

If you'd like to put such high-level capability to work on your communications problems, talk to DIELECTRIC. Capabilities, facilities and accomplishments are described in our brochure. Write for it today.

Other areas of **DIELECTRIC** capability in coaxial, waveguide and open wire techniques . . .

TRANSMISSION LINE & COMPONENTS • NETWORKS • SWITCHES
TEST EQUIPMENT • R&D ENGINEERING

dial DIELECTRIC for solutions to communications problems.

DIELECTRIC PRODUCTS ENGINEERING CO., INC.

RAYMOND, MAINE

Marianas—(left) Temporary officers of the chapter are: (L to R) Maj. F. A. Wall, AACS/USAF, secretary; Lt. Col. W. E. Bullard, AACS/USAF, president; Cdr. J. Gates, NCS/USN, 1st vice president; L. V. Richmond, FAA, 3rd vice president; J. Driver, RCA, 2nd vice president. Not pictured is R. Gassner, Philco/USAF, treasurer. **Paris**—(right) An executive committee meeting was held September 16 at the Seine Area Officers Open Mess. Plans for future chapter meetings were made at that time. Committee members present were: (L to R) Maj. J. E. Mills, secretary-treasurer; M. V. Laveran, director; G. Rabuteau, honorary vice president; Mr. Jean, honorary vice president; H. M. Angeles D'Auriac, director; A. de Bondini, 2nd vice president; RAdm. T. A. Torgerson, 3rd vice president; Dr. M. E. Deloraine, honorary vice president; Maj. Gen. F. W. Moorman, president; Col. J. Hessel, director; Dr. M. Ponte, honorary vice president; Brig. Gen. K. F. Zitzman, 1st vice president; R. A. Aubert, director.

Association News

Birthday Greetings Sent to Eisenhower

On the occasion of his 70th birthday, greetings were sent to President Eisenhower from the Association. The following telegram was received at national Headquarters in acknowledgment:

I DEEPLY APPRECIATE THE GREETINGS YOU SENT ME, ON MY RECENT BIRTHDAY ANNIVERSARY, ON BEHALF OF THE OFFICERS AND DIRECTORS OF THE ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION AND ITS AFFILIATED MEMBER COMPANIES.

DWIGHT D. EISENHOWER

Delco Radio Division Joins Association

Delco Radio Division, General Motors Corporation, has become a group member. The Division is in radio and electronics manufacturing. J. H. Guyton, chief engineer, Radio, will act as the representative to National Headquarters for the company.

Those named to membership in the Association are: M. J. Caserio, R. B. Brown, J. C. Crawford, J. H. Guyton, Dr. F. E. Jaumot Jr., R. L. Jenkins, M. J. Manahan, H. T. Pyle, B. A. Schwarz, H. M. Stelzl.

Comptometer Corp. New Group Member

Comptometer Corporation of Chicago has joined the Association as a group member. E. A. Roberts, vice president, will act as company representative.

Others named to membership are: A. R. Friesel, contract administrator; P. G. S. Mero, vice president; J. M. Doterding, assistant manager; R. D. Cortright, manager; R. E. Bennett, assistant manager; L. A. Tyler, physicist; J. C. Peltier, consultant; G. Warnke, manager; C. A. Levin, director of research.

NEW MEMBERS

Listed below are new members of AFCEA who have joined the Association during the month of October. Members are listed under the chapter with which they are affiliated. Amateur radio operators are listed with their call letters.

Atlanta
Thomas E. Atkerson
Paul K. Rhoads
William R. Nash
Robert C. Colvin
Capt. Floyd H. Clark
Lawrence L. Bray
Samuel E. Nelson
J. H. Dease
Harlow D. Dodge
W. Grant Wilbanks
Arthur W. Staley
Kenneth R. Wilding
Charles S. Henagan, Jr.
Kenneth D. Brown

Augusta-Fort Gordon
Samuel E. Strauss
SFC. Samuel J. Andaloro
SFC. Nathaniel L. Spotser
M-Sgt. John W. Overton
William C. Smith
Capt. Lowell W. Parker
Col. John M. Raleigh, USA
Theodore C. Steinbeck, Jr.
Paul C. Fleri, Jr.
Robert W. Walker
Major James E. Neary, USA
Claud Short
Robert C. Ed

Boston
M-Sgt. Stanley A. Hanson, USAF
Patrick C. McFaull
David A. Nadel

Cape Canaveral
William J. Gebler
Major Billie J. Smith, USAF, (Ret.)

Chicago
J. F. Auwaerter
R. H. Klich
Roy T. Olson, Jr.
Gregory I. Michnick
William E. Doerr, Jr.
John P. Howe
Capt. James M. Kralovec
Robert C. Schur
Edward L. Grant
John Erwood
CDR. Walter W. Tolson
G. Warnke
C. A. Levin
L. A. Tyler
J. C. Peltier
R. E. Bennett
R. D. Cortright
J. M. Deterding
E. A. Roberts
P. G. S. Mero
A. R. Friesel
Capt. Douglas H. Lyness

Cincinnati
Robert G. Gross
Benjamin George Hedges
Charles P. Carey

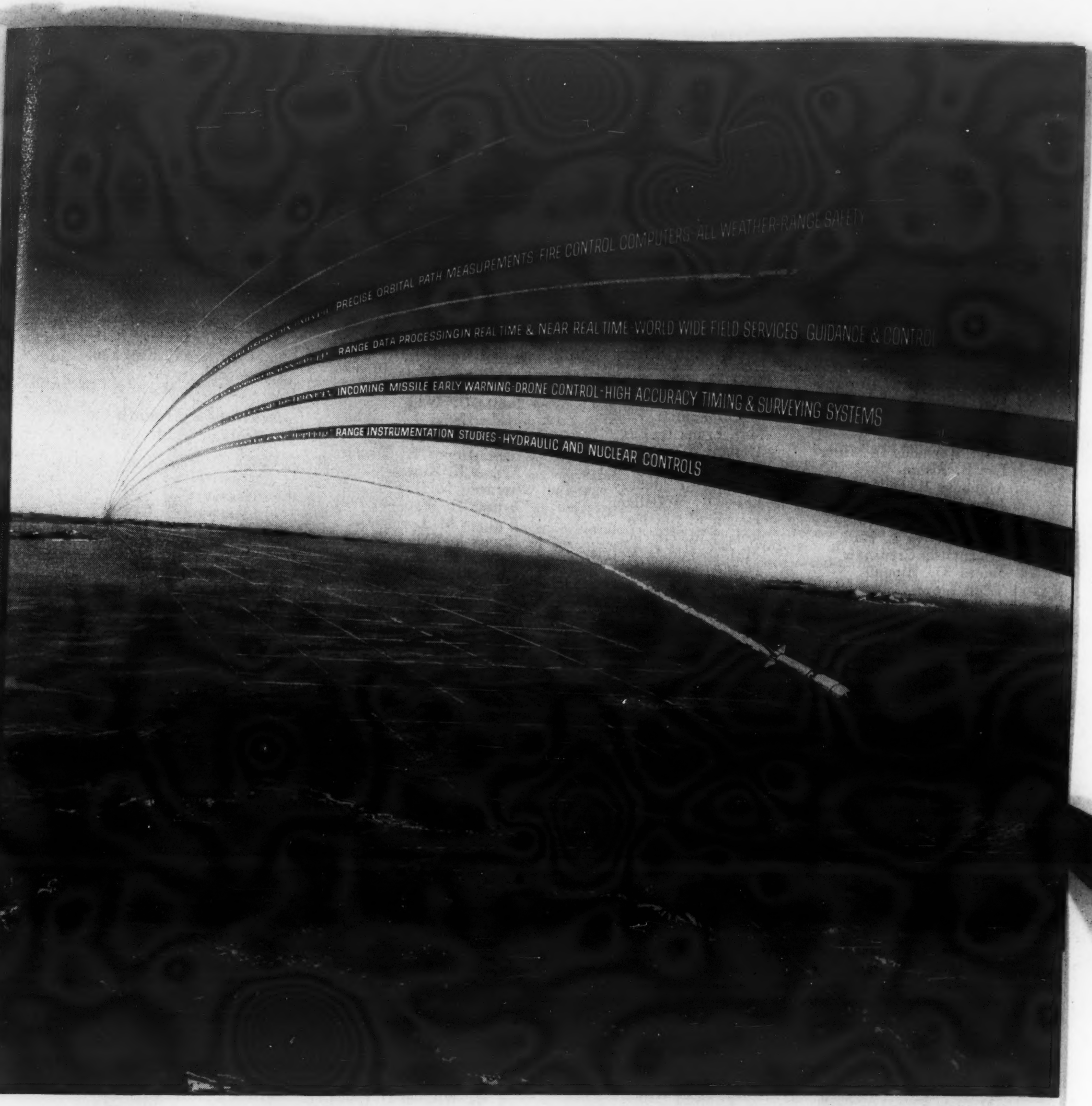
Decatur
James R. Leslie
Earnest P. Reynolds
Robert E. Reynolds
Garner A. Portlock
Otis G. Ryan
Everett F. Moore
Charles D. Ruble
Leon Irvin Searcy
Edith M. Smith
George T. Smith
Paul J. Spar
Michael John Sobieski
James J. Comerford
David E. Comp
Robert D. Richards
Gale Dean Reason
Herbert L. Poundstone
Herman A. Niemann
Carlos D. Martin
Warner E. Gill
E. Roger Etter
Donald R. Dye
William D. Crawford
Robert S. Hauber
Glen H. Keller
Gregory Allan Barber
Richard Lee Baum
Richard H. Barnhart
John W. Suppes
Forrest M. Tate
Glen L. Thompson
Dale Leonard Maddox
John R. McFadin
Terry L. McCoy
Eleanor Duncan
John H. Camp
Eugene G. Cragi

Ft. Monmouth
Col. Estill S. Thurston
Sidney Sandler
1st Lt. Frank J. Schober
John C. Finlay
Margaret A. Phelan
Col. Herbert R. Archibald
James G. Aldrich
Capt. Augustus O'Brien, Jr.
George M. Eagar
Ermio J. Truppa
Thomas J. Ames
Lt. Col. Rodney S. Kepley
Lt. Col. Benjamin I. Hill
John L. Moncrief
Charles Grossman
Eduard A. Gerber
Vincent E. Reilly
Vincent J. Kublin
S. Benedict Levin
Charles Arthur Zelaites
Lt. Col. Edward N. Jenkins
Capt. Claude S. Simpson, Jr.
Col. Raymond H. Bates
Lt. Col. Robert O. Johnson

Greater Los Angeles
Dr. F. E. Bond
H. F. Meyer
David G. Soergel
LCdr William G. Walston, W4NDB, KH6CMJ, K6SXJ

Gulf Coast
S-Sgt. Richard H. Bingle
David E. Fox

(*Continued on page* 56)



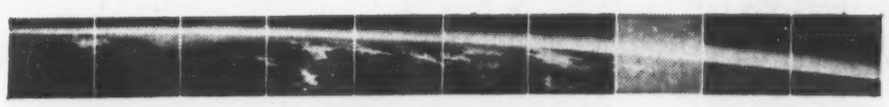
THE MISSILE RANGE: Measure of Capability

The missile range today is a vast proving ground for advanced technologies. It symbolizes the "state of the art" in computation, physics, chemistry, metallurgy, propulsion, hydraulics, electronics, inertial guidance, communications and every other scientific field.

The most critical need of the missile range is to *know system performance exactly*. This calls for integrated standards of measurement and data handling, and therefore for entire systems and entire installations engineered to that objective.

To this problem Sperry Rand has a logical answer: *compatible instrumentation.* The scope of Sperry Rand capability, illustrated above, embraces the whole panorama of the space age. Compatible Instrumentation is the principle of precision in missile range measurement, and a plan of action for applying this principle to projects now developing.

For the necessary team approach to missile range technology Sperry capabilities are joined with those of all other corporate divisions which have contributions to make—among them Ford Instrument Company, Remington Rand Univac, Vickers Incorporated and several component divisions specializing in microwaves, electronic tubes and solid state devices. General Offices: Great Neck, N. Y.



SEA · SURFACE · AIR · SPACE

SPERRY 50 YEARS 1910 1960

Alexis Stathis
Robert C. Booher
John A. Rummans
Russell A. Lott
Russell E. White
1st Lt. Dwight B. Trippe
Capt. Robert B. Baslee
Francis W. Toon
Lois Massey
Capt. Marshall J. Thixton
1st Lt. Robert B. Geiger
Lt. Col. James T. Duvall
Maj. Chester Koniak
Capt. John W. Heath
1st Lt. Lloyd L. Gemienhardt
Capt. Everett E. Howard
Maj. Eldon M. Johnson
L. D. Robinson
Douglas E. Jones
TSgt. Raymond D. Miller
Lee R. Bishop
Alphonse B. Dubuisson
John D. Hanna
TSgt. Eldow H. Dale
TSgt. Melvin L. Hall
TSgt. Ottis Crenshaw
James O. Blount
TSgt. Lloyd L. Turner
Robert H. Haier
Maj. Anna L. Briggs
Lt. Martin W. Sebe
Zelma Feldman
Capt. Robert J. Berns
Wilford L. Harbour
Maj. Maurice F. Baird
1st Lt. Anthony M. Skiscim
Capt. Billy J. Miller
Cecil H. McClure
SM-Sgt. James F. Musick
Maj. Ray J. Welty
SSgt. Newton I. Chambers
2nd Lt. John L. Cloyd
A-C Loren M. Mitchell
Prosper E. Verheeck
SSgt. Vernon K. Dove

Hawaii

Carl Montgomery Wood
Albert S. Ikeda

Kansas City

Maj. Evan Morgan, Jr.

Lawton-Ft. Sill

Otto E. Moates
Roy B. Maynard, W5FGI

Lexington-Concord

William V. McGalliard
Francis J. Zoda
John F. Cronin, W1SJI
Ben Warriner, IV, K5VPO
Stanley J. Gawelko
Harry A. Wilson
Josiah M. Briggs
Lt. Col. Kenneth A. Johnson
Arthur M. Cochram
Milton L. Gould
Charles R. Bruyr
Leroy F. Marion
Harry Letaw, Jr.
Harold M. Hart
Meyer G. Gorfinkle
Robert T. Flynn
Bernard T. Sims
Lt. Col. Irving H. Gravin
Hollie A. Wilkes
John C. Graham
Walter H. Baucom
Thomas L. Longtine
1st Lt. John F. Hoyt
William V. Granacki
William B. Walker
Bruce R. Macdonald
Richard J. McCusker
Maj. Gen. Clyde H. Mitchell
George Twigg, III
James Joseph Hooper
Leslie R. Vincent
H. W. Bolar
Dominic G. Natella
Albert Hunt
Laurence E. Carroll
B. Howard Dean
Lesly W. Williams, W4ERZ
Henry C. Alberts
John H. Hill
Robert J. Lynch
Col. Donald H. Higgins
Maj. Frank O. Lux
Mathew R. Zale
John H. Carter
Lawrence R. Jeffery
Loren G. McCollom
Joseph F. Rhodes
Robert M. Hatcher
Maj. Donald L. Mercier
David Bellare
Capt. Rufus D. Hutcheson
George F. George
Robert M. Mattison
Charles Gilfix, Jr.
Edgar J. Threadgill
Michael J. Konior
Lola Dickerman

Lexington

Stephen E. McCallum, K4URX

London

John C. Bradbury-Williams
Capt. Theron A. Smith
Mansford Elmer Drummond
Lt. Col. John T. Newman
Lt. Col. Galen M. Haven
Nicol Dundas
Thomas F. Hargreaves
Eric E. Pratt
John P. Jeffcock
J. C. Parker
Col. Ronald G. Miller
Sir Reginald Payne-Gallwey, BT
Kenneth S. Davies
Raymond J. Hitchcock

Louisiana

Homer L. Hitt

Marianas

Capt. Ronald T. Keller
Lt. Col. Wilmer E. Bullard
Lt. Kenneth D. Albritton
Capt. Raymond A. Tuttle
ET2 George G. Eitel, Jr.
ET1 Joseph B. Gough
ETCS Raymond M. Tierney
MSgt. Joseph E. Frazier
SSgt. John O. Felix
SSgt. Edward S. Ward
SMSgt. Daniel O. Rodgers
John D. Driver, KG6AGQ
Capt. James J. Kahl, K4LDT
George W. Cook, KL7CLJ
Manuel Marin, KS6AE
Alexander S. Hadad, KG6AIY
Charles L. Holden
Chester D. Hand, KW6CX
Lt. j.g. Philip Jacobsen, W3GFY
Robert A. McLaughlin, KG6AJB
MSgt. Robert L. Kegg, K6DUK
Lloyd V. Richmond
Arthur Z. Smith
Cdr. James L. Gates, K3CJM
Walter F. Abbott
Lt. Robert F. McCarty
SMSgt. Gene S. Cole
MSgt. Ronald L. Baker
SMSgt. Philip W. Richardson, III
MSgt. William J. Cowand
CMSgt. Oscar J. Younce
James E. Martin
James O. Long
LCdr. Henry J. Pisanko
CWO Frank Spisak
Capt. Henry H. Woolard, Jr.
Arthur K. Kawai
Gerardo N. Daguio
Arthur H. Watt
William M. Lorimer
Homer L. Willess
Ronald H. Inefuku
Capt. Russell E. Zink
Capt. Marion P. Slatter
Benjamin K. Chang
Peter T. Conaway
Raymond D. Sutherland
Joseph P. Paterson
William A. Green
Robert O. Burr
Joseph W. Hicks
Melvin A. Wilson
Raymond H. Anderson
Raymond O. Waldin
Lt. Col. Alfred C. Dowlearn, III
Capt. Jerry P. Holman
1st Lt. Joseph C. Anderson
CWO Robert L. Sonnenberg
CWO-WE Arley McKinney
CWO Clarence L. Seaver
Rodgers F. Gassner
Arnold E. Wilson
David G. McClure
CMSgt. Thomas L. Sims
SMSgt. William A. Franklin
Bobby O. Brunner
Sanford L. Glassman
MSgt. Raymond E. Dunn
MSgt. Armand J. Petri
Capt. Alexander Patrick
TSgt. Charles F. C. Hawley
TSgt. William D. Clark
Donald F. Berrigan
John H. Welch
James T. Kushima
Kenneth K. Kuroiwa
Capt. Ralph W. Brown
Maj. George T. Lane
Capt. Charles B. Jiggetts
Capt. Dana R. Dow
Albert S. Brooks
Maj. Ralph L. Swearingen
Don R. Auguston
George C. Barnet
MSgt. William C. Larue
Lt. Jackson H. Honeycutt
Lt. j.g. Ronald D. Howe
Cdr. Paul J. Karl, Jr.
MSgt. Lyall J. Stoutner

Montgomery

Robert E. Steiner, III
Henry M. Price, Jr.

New York

William M. Dubbs
James A. Denning
John J. Foley, Jr.
Howard P. Levy
Stanley B. Snyder
Gerard T. Wilson
T. Erickson
Leonard Newman
Chris H. Behrens
John H. Wartti

North Carolina

William D. Bailey, Jr.
Capt. Arthur L. Charlton, W4NFN
Jerome L. Boyd

Northwest Florida

L. Morgan Smith

Paris

Maurice Olivier
P. Chavance
Lt. Marston K. Rogers
Lt. Col. Richard E. Potter
Hubbard S. Hayes

Philadelphia

Joseph L. Malik
John C. Donofrio
Emily R. Baker
Mildred E. Cahan
Jack T. Heckelman
Stella M. Conlin
Capt. J. J. Edgerly, W4RQO
Anne V. Dunman
Raymond C. Stone

Rocky Mountain

Maj. Glenn W. Frum
Alvin G. Johnson
Robert Nelms
Maj. Kenneth O. Woodruff
Capt. Nonnie D. Herrin
Capt. Walter A. Hogge, Jr.
Walter H. Johnson
James E. Romero, Jr.
Felix G. Dickson

Rome-Utica

Joseph C. Newman
Capt. Wayne E. Cantrell
Roy W. Glassey

San Diego

Joe H. Moore
Brig. Gen. James G. Smith, W6RT

San Francisco

Amado H. Olvera
Charles Neumiller
Renato J. Baculo
Joseph F. Garriott

San Juan

Ralph Perezperry
Rodriguez Manuel Angueira
Samuel L. Espada

Scott-St. Louis

Maj. Harold W. Christy
George G. Hoagland
Edward E. Ronan

South Carolina

Edwin Henry Beach

South Texas

William Randolph
Howell Dickson
Warren W. Settlemeyer

(*Continued on page* 58)

ALDEN SCANNERS MARK NEW ERA IN FACSIMILE COMMUNICATIONS

Compact, mobile Alden Flat Copy Scanners are in use today throughout the U. S. Weather Bureau Hi-Altitude Facsimile Network — marking a bright new era of simplified, continuous facsimile communication. And here are the reasons why —

NEW INSTALLATION SIMPLICITY . . . within two hours of air delivery, Alden Scanners at the Hi-Altitude Network were uncrated from their fold-away shipping cases, rolled in, plugged in, and *fully tested* for 60, 90, and 120 RPM quiet and dependable operation.

NEW COPY HANDLING SIMPLICITY . . . map transmission is no longer dependent on exact drum mounting. With Alden's expandable copy feed head, maps of *any width or length* can be scanned, one after the other, fed straight or crooked, *with only one Alden Scanner.* Original plotted maps can now be scanned without cutting to size. Map plotters have originals returned in half the time. Space and maintenance problems are minimized.

NEW CLARITY — NEW SHARPNESS . . . with copy feed rolls precisely positioning surface of the map on the flat copy scanner table, exact focal lengths are maintained for clear, sharp recordings. Focus smudge caused by unusually thick copy or copy lifting from drum is *completely eliminated.*

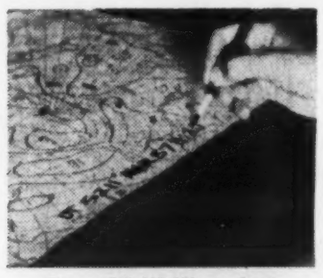
MEETS ALL FUTURE REQUIREMENTS . . . the practical scanning equipment for a world-wide facsimile map network. Speeds can be easily increased — without reengineering of equipment — for use with coaxial or microwave transmission facilities and computer-processed weather data.

WHAT ARE YOUR FACSIMILE REQUIREMENTS? LET'S GET TOGETHER . . . Alden Flat Copy Scanners and Recorders are available in all sizes (and up to 30 times present network speed) to users and qualified manufacturers. Your inquiry is invited.

HERE'S WHY FORECASTERS PREFER* ALDEN RECORDERS AND ALFAX MAPS AND WHY WE THINK YOU'LL LIKE THEM TOO!

MOST COMMENDED FEATURES OF ALFAX MAPS

Color Is Easiest To Read Under All Lighting Conditions



Ease Of Writing And Erasing Enhances Analysis

Clean Crisp Duplicates By Bruning Or Ozalid

PLUS THESE UNIQUE FEATURES

LOW COST . . . Alfax papers save ⅓ to ⅔ yearly paper costs.

CLEAN . . . Electricity is the Ink . . . ion deposits make crisp brown marks on clean white background — free from dust, smudge and chemical irritants.

PERMANENCE . . . Alfax stores indefinitely . . . recording marks are permanent.

* In surveys of weather forecasters experienced with all weather facsimile systems, 3 out of 4 indicated a marked preference for Alden Recorders and Alfax Maps.

MOST COMMENDED FEATURES OF ALDEN RECORDERS

EASE OF INSTALLATION
Compact, mobile, and ready for immediate operation.

Uncrate

Roll in

EASE OF OPERATION
A new high in clean, quiet, trouble-free operation

Instant Visibility

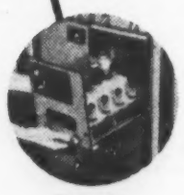
Easy Paper Loading

Automatic Time-Clock Programming

EASE OF MAINTENANCE

Front panel checks

Back connector checks



Plug-in construction

PLUS THESE UNIQUE FEATURES

SECURITY . . . Low voltage marking process does not generate a signal that can be intercepted.

HIGH SPEEDS . . . Sixty, 90 or 120 RPM operation — recorder technique and paper capable of 15 times these existing speeds.

VOLUME PRODUCTION . . . Designed for volume production on short lead time through unique expandable manufacturing processes.

CEILOMETER BREAKTHROUGH

Used with rotating beam ceilometer, Alfax paper and Alden recording techniques replace continuous live scope observation with a continuous pictorial history of cloud conditions. Dynamic tone-shade gradients in warm color reveal all pertinent ceiling information in easy-to-read, easy-to-interpret form. Superimposed dark maximum signal marking shows exact reportable cloud height.

ALDEN ELECTRONIC AND IMPULSE RECORDING EQUIPMENT CO., INC.
Alden Research Center **Westboro, Mass.**

HIGH SPEED PHOTOGRAPHY CONGRESS

A SIGNAL STAFF REPORT

THE FIFTH INTERNATIONAL Congress on High Speed Photography was held in Washington during the week of October 17. First held in Washington in 1952, various cities of the world have played host to the Congress every two years since then. Scientists from the United States and a number of foreign countries presented over one hundred papers at the Congress. It received official recognition from the United States government in the form of a congressional resolution and a Signal Corps grant made on behalf of the Armed Forces.

Dr. Hubert Schardin, Director of the German-French Institute in St. Louis, France and Deputy Chairman of the Congress received the newly established E. I. du Pont Award for his research in ballistics photography and his contributions to the Cranz-Schardin system of high speed photography. The 1960 Journal Award of the Society of Motion Picture and Television Engineers was presented for a paper entitled "Synthetic Highs —An Experimental TV Bandwidth Reduction System." The paper was the result of the collaboration of William Schreiber, Christopher F. Knapp and Norman D. Kay, at the Technicolor Corporation.

A new electronic tube with sufficient sensitivity to "see" individual particles of light was announced by Westinghouse Electric Corp. The tube, called the Astracon, is used in a new camera designed to photograph high energy particles. When the particles pass through a crystal, they leave a luminous track, which unfortunately is too dim to be photographed. The Astracon performs the function of amplifying the brightness of the track sufficiently to be photographed. The Astracon takes incoming particles of light and uses them to release electrons from a light-sensitive input surface. The emitted electrons are accelerated and guided successively onto a series of thin films. At each film, an incident electron ejects five or six additional electrons, which move on to the next film. After being multiplied in this way through several stages, the electrons strike a phosphor screen similar to that in the viewing end of a television picture tube. Here they re-emit about 10,000 photons in a four stage tube for each photon that originally entered the tube. As a result, dim "unseeable" images on the tube's input surface are increased in brightness at the output as much as several thousand times.

Edgerton, Germeshausen & Grier, Inc., announced two items, the Flash Illuminator and the Microflash. The Flash Illuminator produces short duration flashes for extreme close-up photography of minute and microscopic subjects. The relative coolness of microflash is important where damage to the subject by heat is a factor. The Microflash is a guided spark unit that produces a flash of ultra short duration with a high peak for the photography of bullets and other high speed subjects.

The Mach Zehnder Interferometer for the measurement of density changes in transparent media by light interferences was exhibited by Carl Zeiss Inc. This instrument is used for measurements of fluid flow, particularly in wind tunnels and shock wave tubes, temperature distributions in the environs of heated substances and measurements in fluids.

The considerable progress made in the field of high speed photography since the first Congress held in 1950 was described in a paper by R. Wayne Anderson of the Dow Chemical Co. At that time, the commercially available high speed cameras were manufactured and sold by about three concerns, with top practical speeds ranging from 3,000 to 8,000 frames per second. Film speeds were relatively slow. Today, there are at least six manufacturers of high speed equipment in the United States, producing a wide range of models covering speed ranges from 150 p.p.s. to 4,300,000 p.p.s. High speed black and white emulsions which can be pushed to A.S.A. 4,000 are commonplace, and the dream of yesteryear, high speed pictures in color, is now a reality.

Applications, both military and industrial, have increased greatly. In many research programs, such as explosives, flow studies and ballistics, high speed photography is the only method of obtaining data. In one research project, a $100,000 test setup employing a time of flight mass spectrometer would be useless if the data could not be recorded using a high speed drum camera. Mr. Anderson also outlined a number of recent industrial applications in his paper.

Other papers covered developments in all phases of high speed photography. A paper by E. J. G. Beeson of the A.E.I. Lamp Co. Ltd. of England was particularly interesting in the field of short duration light sources. He discussed the control of a xenon arc discharge by means of a magnetic field. In this way a lamp can fulfill a dual purpose by emitting light radiation while functioning as its own circuit breaker.

Bernard A. Bang of the Bendix Corp. presented a paper on the use of high-sensitivity closed circuit television equipment where the effective exposure limitation is below the capability of direct photography. The effective speed of such systems has been increased rapidly in the last three years, so that equivalent ASA ratings of 100,000 are now available.

The Congress plans to publish the papers and discussions in the Proceedings of the Congress, scheduled to appear by mid-1961.

Charles M. Brewton
Henry Seibel
Harold E. Watkins
Charles W. Ratcliff
Capt. Morton J. Frankie

Southern Connecticut
August C. Kircher

Syracuse
J. Edwin Bauer
Richard Youso
E. A. Springer
Robert E. Springer
Joseph P. Feller

Tinker-Oklahoma City
William C. Fitzpatrick
Edwin T. Brady

Tokyo
Sol W. Sanders
Robert C. Bergmen

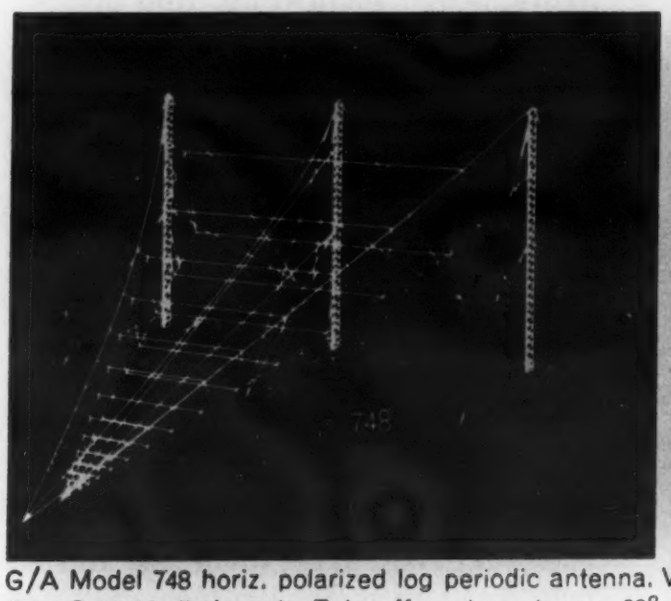
Washington
Shelby G. Tanner
Edward R. Wagner
Louis O. Yack
Robert R. Mallory
Thomas E. Diggin

LCdr Vincent Blascoe
John O. Henderson
William B. McGinty
Col. Harry Margolies
Lawrence R. Cohen
Thomas D. Hobart
Ennis W. Taylor
D. Dittberner

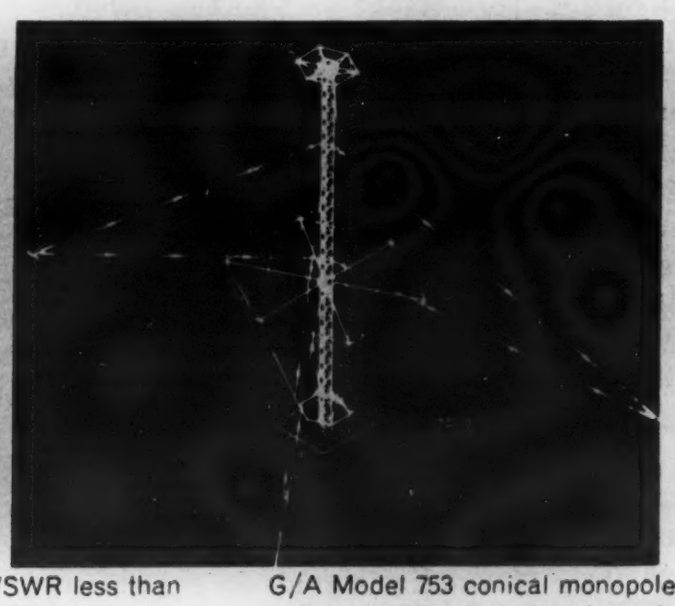
Members-at-Large
William E. Bailey
Douglas B. Carnes
Alfred J. Mallette
James J. Madden

Daniel E. Emerson
Gordon R. Morin
Roy A. Sefton
H. M. Stelzl
B. A. Schwarz
H. T. Pyle
M. J. Manahan
R. L. Jenkins
Dr. F. E. Jaumot, Jr.
J. H. Guyton
J. C. Crawford
R. B. Brown
M. J. Caserio
Cdr. Clayton G. Lawrence

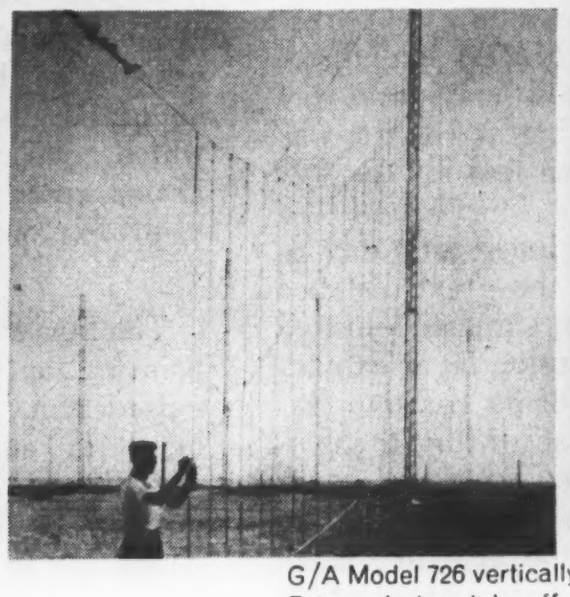
GRANGER ASSOCIATES' broadband **log-periodic** and conical monopole **antennas** are making an important contribution to more **flexible,** more **reliable** and more **economical hf radio communications.** They offer direct **savings** in **land,** in **power** and in **circuit down time.** Each design provides a **low and constant input VSWR** over its entire operating frequency range—to minimize transmission line losses and equipment tune-up time. These antennas offer **radiation patterns** with **excellent broadband properties.** Take-off angle can be controlled for each application. Since both radiation pattern and input impedance are essentially **constant vs. frequency,** and efficiencies are high, it is possible to radiate a maximum of **power** in an optimum **direction.** G/A also offers broadband **balun transformers** and **receiving and transmitting multicouplers** which permit use of multiple equipments on a single antenna. A staff study that explains **GRANGER ASSOCIATES'** hf communications accessories and their applications is **available now.**



G/A Model 748 horiz. polarized log periodic antenna. VSWR less than 2:1. Gain 13 db (nom.). Take-off angle as low as 23° with 200' tower.



G/A Model 753 conical monopole omni-azimuthal antenna. For broadcast applications; easily stowed and erected. 6-24 megacycle version has VSWR of 2.1:1.



G/A Model 726 vertically polarized monopole log periodic antenna. VSWR of 2.1:1 (nominal). 10 db gain. Extremely low take-off angle. Several antennas can be arrayed to compress azimuth beamwidth.

Send For Complete Information **GRANGER ASSOCIATES / 974 Commercial Street / Palo Alto, California / DAvenport 1-4175**

NEWS ITEMS AND NEW PRODUCTS

Shipments of electronic components by U. S. manufacturers reached another all-time high during the first quarter 1960, the Electronics Division, Business and Defense Services Administration, U. S. Department of Commerce, reported.

Output of electron tubes, semiconductor devices, and other major electronic components during the first three months of 1960 increased 8 percent over the preceding six month rate and more than 20 percent above the first half 1959 rate. The increase was not general. Shipments of quartz crystals, transformers and transistors were up sharply, whereas output of television picture tubes, which is generally subject to seasonal declines during the first quarter, and power and special purpose tubes declined slightly during the first quarter 1960.

Japanese electronic industries continued to expand their output during the first half of 1960, BDSA also reported. Total production amounted to $565 million—40 percent higher than during the first half of 1959.

Production of consumer items, which still accounts for the major portion of total Japanese electronics output, increased from $224 million in the first half of 1959 to $320 million in the first half of 1960—an increase of 43 percent. Production of television receivers during the first half of this year was higher by 36 percent than the first half of 1959; radio receivers production was up 80 percent; and, radio-phonographs were up 139 percent.

Production of receiving tubes during January-June of this year increased by 63 percent and transistors showed a gain of 48 percent.

The U. S. Embassy, Tokyo, reports that expansion in Japan's production of electronic products during the first half of 1960 can be attributed in part to the increase in exports but more basically to the high level of investments in Japanese industries and the continued rise in consumption levels of the Japanese people. Within the electronic industries, also, there was a significant increase in the number of technological agreements to improve production processes.

• • •

The U. S. Naval Research Laboratory's Solar Radiation I satellite—launched on June 22, 1960 as the "piggy-back rider" of the Transit IIA navigational satellite—is transmitting the first continuous measurements of solar activity in X-ray and ultraviolet radiations. These solar weather reports can be correlated with a host of ground level observations to help unravel the mysteries of ionospheric behavior as well as the mechanisms of solar storminess.

Studies of the satellite operation indicate that Solar Radiation I will have an operating lifetime of at least one year. Since solar power exceeds the system requirements, it is unlikely that solar cell deterioration will be discernible in the first year. The transmitter power output varies only with battery voltage and temperature, so no deterioration with time is apparent. The satellite operated in a dark orbit at a temperature of +16° F. until September, and then began an eleven day period of continuous sunlight where the temperature rose to +52°. This establishes the temperature limits to be expected in the one year operation of the satellite.

• • •

John T. Chambers, of the Hughes communications division, has recently been awarded the American Radio Relay League 1960 Award of Merit for his ham radio experiments in transmitting signals to a station in Hawaii—a distance of 2540 miles—on the 144 and 222 megacycle bands.

Chambers' accomplishment was described as "unique in the history of VHF communication," by Ray E. Meyers, director of the southwest division of the ARRL, who presented the award to Chambers.

Normally, signals in this band are limited to line-of-sight transmission because they do not follow the curvature of the earth, Meyers explained. He said the previous maximum distance for transmitting at 144 mc was 1700 miles and even less for the 222 mc frequency.

The Hughes engineer was able to communicate over the great distance because his radio signals followed a temperature inversion layer extending from the California coast to Hawaii and beyond, according to Meyers. He said the inversion layer (warm air resting on top of a laver of coler air near the ground) acted as a channel or wave guide which trapped the radio signals and caused them to "bend" around the earth's surface. Standard broadcast band signals do not require such a "wave guide" because they are deflected downward by the ionosphere and can circle the globe. Chambers found that transmission was best when the temperature inversion layer was pronounced and when there was little or no wind.

Chambers operated his transmitter (W6NLZ) in his home located at an elevation of 910 feet on the Palos Verdes Peninsula. After nine months of nightly sending, his signals were received by Ralph E. Thomas (KH6-UK), at Kahuku, Oahu, Hawaii.

The system parameters for transmitting at 144 mc were: transmitter output, 400 W; antenna gain transmitting, 20 db; antenna gain receiving, 15 db; receiving noise figure, 4 db; receiver bandwidth, 500 cycles; S/N as great as 10 db; path loss turned out to be 224 db.

System parameters for the 200 mc band were: power output, 400 W; transmitting antenna gain, 20 db; receiving antenna gain, 16 db; noise figure, 5 db; bandwidth. 500 cycles; signal/noise ratio, 30 db; path loss, 204 db.

Chambers has also established one-way contact at 432 mc. He plans to continue tests at 432 mc, 1296 mc and 2400 mc to establish, if possible, the frequency dependence characteristics.

• • •

The Electronic Industries Association has begun a survey to determine the number of scientists and engineers in the electronics industry. Results of the survey will be turned over to James M. Bridges, director of electronics, Office of the Secretary of Defense for Research and Engineering, so that the Department may determine possible adverse effects which major shifts in defense programs could have on the reservoir of professional electronics manpower.

• • •

The Soviet Union has placed a high priority on training specialists in automation, computer research, cybernetics and machine translation, according to a summary and evaluation of available information prepared by an agency of the Federal Government and released for public distribution through the Office of Technical Services, Business and De-

fense Services Administration, U.S. Department of Commerce.

"New courses, specialties, and institutions devoted to these subjects have been established in increasing numbers since 1955," the report states. "Attention is being given to setting up courses on automation and related specialties even on the undergraduate level."

The evaluators who prepared the report conclude that since mathematics is basic to all these areas and since the Soviets excel in mathematical training, the automation and control training offered in Soviet schools and institutes must be of high quality.

The need for the specialists in the Soviet Union is attributed to the rapid development of automatic control equipment and high-speed computers in Soviet technology and the increasingly important roles these devices will play in the Soviet economy, according to the report.

• • •

Beckman Instruments, Inc., Palo Alto, California, has developed a tiny electrode which makes it possible to measure oxygen directly in the human body. At present the electrode is regarded as a research tool. Potential applications for the electrode range from surgical safety to the study of brain damage and mental deficiency.

The electrode, incorporated in a medical instrument called the Physiological Gas Analyzer, is platinum-tipped, five ten-thousandths of an inch in diameter, and can be inserted into blood vessels, arteries, other body fluid reservoirs, and the brain itself. The electrode produces direct oxygen readings.

• • •

An all-solid-state magnetic tape system with increased FM capabilities has been announced by Minneapolis-Honeywell Regulator Company's Industrial Systems Division.

The LAR 7500 (Laboratory Analog Recorder) can accommodate up to 14 channels of FM and playback in one rack; six tape speeds can be selected from the front panel; tapes as thin as 0.65 mil base can be handled.

The all-transistor FM record/reproduce system accepts analog inputs within a bandpass of DC to 10 kc for as much as one hour of continuous recording. For given tape speeds, frequency response has been doubled over previous models.

Operation of the LAR 7500 is by back-lighted pushbuttons so interlocked that attempted use in any sequence will not damage either the data or mechanism. Accidental tape erasure is prevented by requiring two buttons to be pushed simultaneously.

• • •

Development of a new line of resistor compositions which offer varied resistance values to provide flexibility in miniaturized circuitry has been announced by the Du Pont Company.

The new compositions are available in three resistance values (500, 3500, 10,000 ohms per square per mil thick film) which can be blended to obtain intermediate values. Applied to ceramic dielectric bases by ordinary dip, brush, or stencil screen techniques, the composition is then fired in a normal atmosphere to obtain a durable surface.

Electrical properties of the resistors are reproducible and Du Pont tests show that fired printed patterns and coated rods have abrasion and impact resistance similar to fired silver coatings. The company reports that resistance values exhibit excellent stability under varying conditions of humidity, temperature, overload and voltage.

• • •

A system for the high-speed recording of electronic data as visible and projectable images has been announced by the Kalvar Corporation, New Orleans, Louisiana. The system can transform data at electronic speed into written or numerical characters on film, and into a "TV image" for giant screen projection.

An electrostatic tube, the Printapix tube developed by Litton Industries converts the electronic data to Kalvar film images at the rate of several feet per second. The Kalvar film receives the localized electric charges. The latent image on the exposed film is developed by heat alone in the completely dry process, Kalvar officials stated. All chemicals are eliminated.

• • •

Navigation Computer Corporation announces the addition of the Model 328B Reset Transfer Control unit to its 300 series line of transistorized digital systems modules. This module contains three independent multivibrators each of which is adjustable over a delay period of from three to thirty microseconds. The three units may be series connected by utilizing jumpers which are present on the card. Inverted and non-inverted outputs are available with the latter providing up to 750 ma of drive current capability.

"WRIT BY TELEPH E"*

* Electrowriter instruments are accepted for use over local and long distance facilities of the Bell System, General Telephone System and other telephone companies.

® ELECTROWRITER—TRADEMARK REGISTERED, U. S. PATENT OFFICE

Comptometer's Electrowriter® instruments offer the finest and most versatile telewriting service—unmatched anywhere. Longhand messages received while you write at any distance, be it 50 yards, 5 miles, or 5,000 miles. Electrowriter instruments will write wherever your voice reaches . . .

Ask for a demonstration.

Electrowriter®

COMMUNICATION SYSTEMS BY
COMPTOMETER

COMPTOMETER CORPORATION • 5600 JARVIS AVENUE • CHICAGO 48, ILLINOIS • SPRING 5-2400 • OFFICES IN PRINCIPAL CITIES

SIGNAL was privileged to attend a press briefing at the U. S. Army Electronic Proving Ground at Fort Huachuca recently.

One of the most significant parts of this facility is the Electromagnetic Environment Laboratory, an outdoor laboratory for the study and elimination of RFI. The vast increase in the number of transmitters required by the Army today has added greatly to the radio frequency interference problem. This outdoor laboratory enables the radio equipment of a force as large as an army to be tested under combat conditions.

Research in meteorology is an important activity at Ft. Huachuca. The new science of micro-meteorology, dealing with climatal conditions in the border area where the earth meets the atmosphere, is of particular interest, since the army lives and fights there.

The Electronic Warfare Department is engaged in testing various EW schemes and equipments. The emphasis is on compact multipurpose countermeasure sets for use in front-line areas.

USAEPG is testing a varied group of target acquisition devices under the more general heading of combat surveillance. Most of these equipments are portable, transportable or flyable in conformance with the need for mobility and rapid dispersal in modern warfare. These new Signal Corps equipments include hypersensitive radar sets that can spot vehicles at distances of 500 to 20,000 yards, high speed camera systems, and infrared detection equipment that pinpoint targets by heat radiation. A number of surveillance drones are under test, including one jet powered model.

• • •

A new electronic system which transmits data over the regular telephone network at a speed of 1,500 words per minute has been announced by Digitronics Corporation, Albertson, L. I.

This new development, called the Digitronics Dial-o-verter System, was created to function with the Bell System Data-Phone 200. The system can replace low-speed, electro-mechanical equipment. Currently, data may be transmitted over private telephone or telegraph lines at a speed of 6 to 10 characters per second. The Dial-o-verter System operates via Data-Phone at a speed of 150 characters per second.

The Dial-o-verter System is based on the Digitronics Model D599SR coupler, which forms the interconnection between the Bell System Data-Phone 200 and any of the data media commonly in use, such as paper tape, punched cards or magnetic tape. When transmitting, it is used with a high-speed perforated tape reader, but also can function with a card reader or magnetic tape handler. When receiving, the coupler functions with a high-speed paper tape punch, a card punch or a magnetic tape handler.

• • •

An interplant facsimile system capable of transmitting instantaneously 30,000 average messages per week—letters, forms, financial statements or drawings on any size of paper—more than 300 miles for less than a nickel each, was introduced recently by Alden Systems Company, Westboro, Massachusetts.

Such a system would utilize microwave channels recently approved by the Federal Communications Commission for private use or a leased telephone line, which can be adapted to provide both voice and facsimile communication.

"With this new two-letter-per-minute system, a company can produce a document or drawing immediately at a branch office or plant for less than the copy itself would cost—and this comparison includes amortization of all equipment required," explained John Alden, president of the manufacturing affiliate, Alden Electronic & Impulse Recording Equipment Co., Inc. at the National Business Show in New York.

The cost figures given are valid for the two-letter-a-minute speed, even if equipment is used 50 percent of the time, Mr. Alden said. Costs would decline if the scanner, recorder and transmission links are more fully utilized. The volume user, operating with a full-time leased line, could achieve a per-message cost of approximately three cents, according to Mr. Alden.

• • •

Eglin Gulf Test Range, a 450-mile air-sea corridor off the west coast of Florida, gives the United States a push-button "shooting gallery" for testing and evaluating anti-aircraft interceptor missiles. The 70,000 square-mile installation became operational for the Air Force recently.

This electronic facility, stretching from near Pensacola to Key West, is the only U. S. missile proving ground with multiple capability—tracking and controlling up to three target drones and three supersonic missiles simultaneously. The range is laced and criss-crossed by a web of high-speed communication and telemetry links, channeling a flood of information and data to the control and tracking stations that dot the length of the test area.

Solving the problems presented by this mass data handling and communications undertaking was the responsibility of International Telephone and Telegraph Corp. In all, five major radar, communication and data-gathering sites and several substations were developed to provide fingertip control of the drones and lethal missiles. Supporting ITT Laboratories, which retains system engineering responsibility, were two ITT System companies, Federal Electric Corporation, furnishing installation, maintenance and operating services, and ITT Kellogg, specializing in telephone communication systems.

• • •

Delivery of the first production model of the trailer-housed tactical ground support test equipment for the electronic countermeasures system of the Air Force's B-58 "Hustler" bomber has been made by Sylvania Electric Products Inc. The equipment was delivered to the Convair Division of General Dynamics Corp., Ft. Worth, Texas, prime contractor on the "Hustler" project.

Three engineering pre-production models were delivered previously. A fifth trailer is currently undergoing rigorous environmental tests at the Bell Aerospace Environmental Test Center and the Air Development Command, Rome, N. Y. Four additional trailers will be produced at Buffalo under the contract.

• • •

A new technical bulletin discusses methods for increasing efficiency of data reduction and automation systems for quality control, continuous processing, and large scale experimental work. The need for statistical reduction of data prior to readout is stressed.

Free copies of Technical Memorandum No. 1, *Statistical Data Reduction and Control Systems*, are available from Monitor Systems, Inc., Dept. 1, Ft. Washington Industrial Park, Ft. Washington, Pennsylvania.

• • •

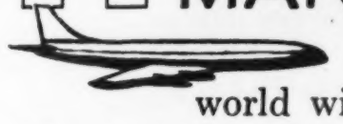
A brochure illustrating and describing the Xerox® Copyflo® 1824 printer is now available upon request from M. E. Harris, Dept. 1824, Haloid Xerox Inc., Rochester 3, N. Y.

On insertion of a sheet of ordinary paper, this new machine automatically turns out a dry, positive engineering print up to 18" x 24" from a

NEW YORK • WORLD CENTER FOR RADIO-ELECTRONICS • 1961

INTERNATIONAL CONVENTION □ □ AND IRE SHOW

□ □ MARCH 20-23 □ □



Visitors from all over the world will converge on the Coliseum, March 20-23, for IRE's big Show and International Convention. Join the more than 65,000 radio-electronics engineers who will attend! □ On the Coliseum's **4** gigantic floors you'll see the latest production items, systems, instruments and components in radio-electronics; in radar; in complex air traffic control; in space communications — in any and every field of radio-engineering you care to name. □ At the convention, you'll trade ideas with brilliant delegates from the world of radio-electronics, and choose from amongst scores of papers to be read by experts in their field. Like the IRE show, the convention is both a summing-up and a look into the future!

Registration: IRE members $1.00—non-members $3.00
No one under 18 years of age will be admitted.

Remember the occasion, the time, the place:

INTERNATIONAL CONVENTION and IRE SHOW • WALDORF-ASTORIA HOTEL • COLISEUM • NEW YORK CITY

MARCH 20-23 1961

The Institute of Radio Engineers

1 East 79th St., New York 21, N. Y.

REMEMBERS THE MAN

IRE

microfilm frame mounted in a data-processing card. The Copyflo 1824 printer is especially designed for small-volume users of engineering drawings or for large, decentralized users.

• • •

The October issue of the *Virginia Law Review* is devoted exclusively to a symposium on State Taxation of Interstate Commerce. The recent Supreme Court opinions in the *Northwestern-Stockham Valves* and *Scripto* cases, and the first federal statute limiting the taxing power of the states, Public Law 86-272, emphasize the need for an up-to-date, comprehensive examination of state taxation which affects multi-state businesses. The contributors of the symposium examine the issues and advance their conclusions from the divergent views of constitutional scholars, economists, businessmen, practicing lawyers and state tax commissioners.

Since the House Judiciary and Senate Finance Committees have tentatively scheduled public hearings for the spring of 1961, in order to re-examine the complex problems and report out new legislation prior to July 1962, this symposium should be both timely and invaluable. Under one cover, there is an analysis of the business, economic, fiscal and legal problems involved, as well as many of the recommendations, suggestions and criticisms that will be considered by Congress.

Single issues are available at $3.50 per copy, with discounts for bulk orders, from *Virginia Law Review,* University of Virginia, Clark Memorial Hall, Charlottesville, Virginia.

• • •

A journal dealing specifically with cryogenics has been published recently in Britain.

Cryogenics is edited jointly by three leading authorities: Dr. K. Mendelssohn, F.R.S. Clarendon Laboratory, Oxford; R. B. Scott, chief of the N.B.S. Cryogenic Engineering Laboratory, Colorado; and Professor L. Weil of the Institut Fourier, Grenoble University.

The first issue contains a contribution by Dr. N. Kurti, F.R.S., of Clarendon Laboratory, Oxford, who discusses the prospects of nuclear cooling. There are also nine original papers from Britain, America, France and the Netherlands, together with abstracts of each in French, German, Russian and English.

In addition to the work devoted to fundamental issues, *Cryogenics* will also publish papers dealing with the increased use of cryogenic propellants as rocket fuels, new methods of handling, storage and transport, low temperature electronics and other technical problems related to cryogenics.

The journal is published by Heywood & Co., Drury House, Russell St., Drury Lane, London, W.C. 2, England.

• • •

Emerson & Cuming, Inc., Canton, Mass., has published an Eccosorb® Microwave Anechoic Chamber brochure.

This brochure describes the simplest box type anechoic chamber as well as the transverse baffle type, aperture type, and the latest longitudinal baffle type, with details of construction together with illustrations of each type of chamber designed and built exclusively by the company to meet specific requirements of frequency range and working conditions.

• • •

A guide book aimed at private industry that spells out major technical problem areas in the development of communications, electronic equipment and systems, has been published by the Signal Corps as part of an Army program. There is both a confidential and an unclassified version of the guide.

Major General R. T. Nelson, Chief Signal Officer, said the volume titled, *U. S. Army Research and Development Problems Guide, Signal Corps,* will be distributed to qualified private organizations through the Commanding Officer, U. S. Army Signal Research and Development Laboratory, Ft. Monmouth, N. J.

Only industries or activities that carry a confidential facility clearance are eligible to obtain the confidential version. For either the unclassified or confidential version the requestor must execute a policy agreement for distribution of Research & Development Documents; present acceptable evidence of a research and development capability; and express a desire to conduct a research and development effort in consonance with that of the Army.

Inquiries should be addressed to: Commanding Officer, U. S. Army Signal R&D Laboratory, Ft. Monmouth, N. J., Attention: SIGRA/SL-LNB.

• • •

Application notes describing how to assemble systems for precision measurement of pressures, forces, and temperatures, and determinations of ratios, summations, integrals, mass flow rates, and center-of-gravity are contained in a 44-page *Systems Engineer's Handbook.* The book is available from Wiancko Engineering Company, 255 N. Halstead, Pasadena, California.

Photoprogress

Development of photographic paper in less than three seconds using only a heated chamber was reported by Paul Stewart, William Borneman and W. B. Kendall of Kodak Research Laboratories at the Rapid Processing Symposium of the Society of Photographic Scientists and Engineers held in Washington, D. C., last October.

The new silver-sensitized, oscilloscope-recording paper has chemicals for development incorporated in the photographic emulsion. Development begins as soon as heat is applied.

The processor is a heating chamber enclosed except for slits at front and back for exposed paper to enter and leave. Moisture driven from the photographic emulsion and paper support condenses on the cool surface of the entering emulsion. The combination of heat and moisture processes the paper in less than three seconds.

A few drops of water in the chamber, or passage of about five feet of recording paper through it, will prime the processor for rapid development.

The new paper, called K-1549, is fast enough for exposure in oscillograph recorders with high-intensity mercury lamps. Oscillograms made with the paper have remained readable for months under reasonably dry conditions. For greater permanence the prints may be stabilized or fixed by conventional methods, Kendall said.

• • •

Bausch & Lomb has announced the new Zoom 70 Stereoscope, which incorporates zoom magnification in a stereoscope for photo interpretation. The Zoom 70 is of value in the field of aerial photography and in industrial areas where comparison of one object with another is desirable.

The optical system is sealed in an B&L Power Pod casing. Two rhomboidal prisms permit dual image viewing, one superimposed precisely over the other at the particular magnification proven best for the object being examined. Separation of prisms ranges from 30mm through 105mm, allowing for all possible image separations on 70mm photography.

Standing from L to R are: George Senn, USARDL Courier project director; Pierce Siglin, project manager; seated from L to R are: Samuel Findler, ground station manager and Walter Teetsel, in charge of all ground sites.

The photograph shown above was sent from the Army Signal Corps ground station at Ft. Monmouth, N. J., to the U. S. Army Courier satellite and retransmitted back to earth. The space photo was actively relayed through the electronic equipment in the satellite in a manner similar to radio-photos on the ground. The process took about five minutes, from insertion of the photograph in the facsimile machine to the Polaroid printing of the relayed picture.

For the experiment, engineers at the Signal Laboratory wired one of their regular facsimile machines, built for high speed wire or radio transmission of photographs or printed matter, to the Courier ground station system of the Laboratory's Astro-Observation Station.

The successful result establishes groundwork for satellite storage and relay of all types of facsimile messages between properly equipped ground stations throughout the world.

• • •

Westinghouse Electric Corporation's new Astracon light amplifier tube has been employed by company scientists to photograph the faint tracks produced when cosmic rays penetrate a solid crystal.

The camera used to photograph these high-energy particles was described by A. E. Anderson, manager of the applied physics department of the Westinghouse research laboratories, at the Society of Motion Picture and Television Engineer's Fifth International Congress on High-Speed Photography held in Washington, D. C.

Such cameras, Mr. Anderson said, are among the newest tools of nuclear physics. Although cosmic rays and other high-energy particles remain within the crystal only about a billionth of a second, they leave luminous tracks which reveal their identity and behavior but which are too dim to be photographed without some means for increasing their brightness.

In the Westinghouse experiments, this brightening is accomplished by the new Astracon tube, a light amplifier based upon a thin film system invented at the research laboratories. Development of the tube for practical application was carried out by a group of research scientists and was supported in part by the U. S. Atomic Energy Commission and the U. S. Army Engineers Corps.

The Astracon takes incoming photons and uses them to release electrons from a light-sensitive input surface. The electrons are then accelerated and guided successively onto a series of thin films. At each film, an incident electron ejects five or six additional electrons which move on to the next film. After several stages of such multiplication, the electrons impinge upon a phosphor screen where they re-emit about 10,000 photons of light (in a four-stage tube) for each photon that originally entered. As a result, imperceptible images on the tube's input surface are increased in brightness on the output screen by several thousand times.

Names in the News

L. H. Niemann has been appointed director of Government Relations for CBS Electronics, the electronic manufacturing division of Columbia Broadcasting System, Inc. **John Manniello** has been appointed to the new position of director of Marketing of CBS Laboratories in Stamford, Conn.

Lt. Col. Mike M. Kovar has been awarded the Air Force Commendation Medal for outstanding work at Military Air Transport Service (MATS) headquarters, Scott Air Force Base, Illinois.

Glenn E. Ronk has been named general sales director of Cornell-Dubilier Electric Division, Federal Pacific Electric Company. **RAdm. Carl F. Stillman,** USN (Ret.), has been appointed administrative assistant to the Cornell-Dubilier vice president-marketing.

Brigadier General Elmer L. Littell has retired from the Army after 30 years of military service. His most recent assignment has been as commander of the U. S. Army Signal Supply Agency since 1957.

Col. George W. Rhyne has been named chief of the Personnel and Training Division; **Col. W. D. Joslin,** chief of the Army Communications Systems Division; and **Col. L. P. Jacobs**, chief of the Plans, Programs and Operations Division of the Office of the Chief Signal Officer.

Alfred Strogoff has been appointed vice president and general manager of Adler Electronics, Inc. **Sheldon Newberger** has been named director of the Operations Division of the company.

Roland P. Andelson has been appointed assistant manager in charge of Hughes Aircraft Company's ground systems group activities in Washington, D. C.

Charles E. Ruckstuhl has been appointed as corporate representative in the Boston area by The Bendix Corp.

Richard C. Saxton has been appointed district manager, government and industrial sales, Dayton, Ohio, for CBS Electronics, a Division of Columbia Broadcasting System, Inc.

Richard C. Higbee, secretary and vice president of manufacturing, Electronic Associates, Inc., has been elected to the additional position of treasurer.

Robert W. Jorgensen has joined The Hallicrafters Company as manager of market development.

Col. Robert F. Frost, USAF (Ret.), has been named director of planning of the new National Electronics Facilities Organization, Inc.

Dale M. Nevitt has been appointed vice president of Manufacturing, Western Design, Division of U. S. Industries, Inc.

William P. Lear, chairman of the board of Lear, Inc., was the first leader of America's aviation industry to be awarded the "Great Silver Medal" of Paris.

Dr. William J. Jacobi has been appointed vice president of Litton Systems, Inc., and general manager of the Guidance and Control Systems Division.

Gov. LeRoy Collins of Florida was elected to a 3-year term as president of the National Association of Broadcasters. He will take office Jan. 4, 1961.

Personnel Available

As a service to AFCEA members, SIGNAL will make space available in this column for those members who are interested in employment in the communications, electronics and photography industries. Any member is entitled to three insertions in the magazine on a space available basis, free of charge. Please limit your notice to 5 lines. In replying, employers are asked to address: Box ——, SIGNAL, 1624 Eye St., N.W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

ELECTRICAL ENGINEER seeks position in communications work. Three years broad design, manufacturing experience in receiver, transmitter and telephone. Two years AACS Maintenance Officer. Salary open. Location Midwest. Box 160.

EX-MILITARY OFFICER desires position in civilian company. Signal Corps officer with two years' experience in fixed station radio equipment and management. B.S. in Business Administration. Salary and location open. Box 161.

FIELD SERVICE ENGINEER with four years' experience in tropospheric scatter and other phases of communications seeks position in Europe. First-class FCC License, speaks French. Presently resides in Paris. Box 162.

CONTRACT'S ADMINISTRATOR with electronics background seeks permanent position within the electronics industry. Experience with customer relations. Familiar with composition of contractual documents, contract administration, proposals coordination, engineering and project planning. Holds TOP SECRET security clearance. Box 163.

MANUFACTURERS' REPRESENTATIVE with record of sales selling components seeks additional quality line on straight commission basis. Box 164.

COMPONENTS ANALYST with experience as USN electronics technician and as military components analyst with civilian firms. Relocating to Los Angeles-San Diego area approximately Feb. 1961. Salary open. Box 165.

Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL.

U. S. ARMY SIGNAL CORPS is seeking officers in the automatic data processing, photographic and television fields. Officer applicants interested in transferring to the Army Signal Corps currently are being sought. Interested officers should write to Personnel and Training Div., Office of the Chief Signal Officer, Army Dept., Wash. 25, D. C.

U. S. AIR FORCE has openings for 24 electronic and 6 electrical engineers at Air Materiel Command installations. Interested persons should write to Headquarters, Air Materiel Command, Attn: MCACE, Wright-Patterson Air Force Base, Ohio.

INDEX TO ADVERTISERS

APPLICATION FOR INDIVIDUAL MEMBERSHIP

ARMED FORCES COMMUNICATIONS AND ELECTRONICS ASSOCIATION
1624 Eye Street, N. W. Washington 6, D. C.

NAME: ..... (Last Name) (First Name) (Middle Name or Initial)

Address .....

.....

Firm or Military Installation: .....

Title: ..... Type of Work: .....

U. S. Citizen ☐ or Citizen of ..... Ham Radio Call .....

Full—$5.00 ☐ Subscription-Non-Member—$7.00 ☐ Foreign Mailing—$8.00 ☐

Enclosed find $..... for annual dues for AFCEA membership (or subscription) which includes the monthly magazine SIGNAL and Chapter Affiliation.

DATE: ..... SIGNATURE: .....

CREATIVE ELECTRONICS FOR DEFENSE

STRANGE "FISH" UNDER THE POLAR ICE

Revolutionary RCA Magnetic Video Tape Recorder to Speed Navigation Training of Submariners

Aboard the nuclear submarine Sea Dragon, the first undersea magnetic video tape recorder will record and store data on under-the-ice characteristics from externally installed TV cameras. Upon return to base the recorded information will be displayed for the benefit of undersea service trainees.

The RCA undersea recorder is a marvel of compact design (dimensions 20" x 20" x 100"). It nestles in a torpedo rack, and represents a 60% space reduction over existing video tape equipment.

Among the exclusive RCA developments are: the now famous "Tiros" satellite recorder; a radar system designed to take the first pictures of a nose cone re-entry vehicle; a unique tape cartridge completely adaptable to any size recorder. For literature describing new RCA defense and commercial products developments, write Defense Electronic Products, Radio Corporation of America, Camden, N. J.

Out of today's defense needs...tomorrow's electronic advances

RCA®

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA

In the struggle for the balance of power, REL's 75 kw tropo scatter transmitter adds a powerful new weapon to U.S. defense, constitutes a major breakthrough in radio communications. Its klystron tube (top), developed for REL by Eimac, is five to fifty times more powerful than other klystrons designed for use at these frequencies.

The new power amplifier is over 30 feet long, weighs more than ten tons, and draws enough power to serve 260 average homes.

Despite this complexity, REL engineers have simplified the tuning process so that only fourteen tuning controls are required - the same number which are needed for a conventional communications receiver.

This powerful new transmitter will provide reliable FM tropo com-

municat
Further,
power le

Anot
you sho

RADIO
A SUBSI
DEPT G

Creative c
Address re

ONEERING BY REL

PO TRANSMITTER

unications at previously unattainable leaps of 400 miles or more. further, it has been flexibly designed for different frequency ranges and ower levels.

Another REL first *to keep America* first *in defense. Another reason ou should consult REL* first *on your radio communications problems.*

RADIO ENGINEERING LABORATORIES·INC
SUBSIDIARY OF DYNAMICS CORPORATION OF AMERICA
EPT G · 29-01 BORDEN AVENUE · LONG ISLAND CITY 1, NY

reative careers at REL await a few exceptional engineers.
ddress résumés to James R. Day, Vice President, Engineering.